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The appliance of macroprudential instruments to ease the financial distress caused by COVID-19

A global summary of the year 2020

School of Accounting and Finance
Master's Thesis in Economics
Master's Degree Programme in Economics

Vaasa 2021

University of Vaasa
School of Accounting and Finance
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Title of the Thesis: The appliance of macroprudential instruments to ease the financial distress caused by COVID-19 : A global summary of the year 2020
Degree: Master of Science in Economics and Business Administration
Programme: Masters Degree Programme in Economics
Supervisor: Panu Kalmi
Year of Graduation: 2022 **Pages:** 100

ABSTRACT:
The COVID-19 has already been among us for nearly two years. It has caused significant humane despair but also caused substantial adverse shocks to the economy. There have been lockdowns, and supply chains have been under great stress. Even after vaccines have been developed against the disease, the uncertainty on the economy remains high. To provide more resilience for financial markets, governments have utilized macroprudential instruments. The instruments re-emerged in the aftermath of the Great Recession of 2007-2009 as regulators understood that it was not enough to supervise all the institutions individually. There is risk embedded directly in the financial markets, systemic risk, that can cause a significant downturn if left untouched. The systemic risk can be divided into two, cyclical and structural, depending on how it accumulates. Both are still divided further and followed by supervisors globally. Three global organizations, The Bank of International Settlements, International Monetary Fund, and Financial Stability Board, all have a crucial role in developing the macroprudential supervising. However, most of the decision-making happens at the domestic level, which, for example, provides Euro-countries way to balance unified monetary policy decisions. To spot the systemic risk from the markets, banking supervisors use an early warning system. It will inform of changes and enables the regulators to start acting well before the risk materializes. To address the specific macroprudential issue in the economy, the instruments divide into three categories. Credit-related instruments affect the demand side of lending, where liquidity-related and capital-related instruments do the same for supply. There is an issue with current research what comes to the macroprudential instruments. As the measurements re-emerged only after the last significant economic turmoil, there are primarily studies on how well they prevent a downturn. This thesis aims to understand better whether the active use of macroprudential instruments can hinder welfare loss during economic distress. To study this, data from 47 countries were researched and empirically tested using multiple linear regression. However, no statistically significant dependency concludes between the active utilization of macroprudential instruments and slighter loss of gross domestic product. The results do not mean that the instruments are not working. As they are just part of a more extensive repertoire of measurements, a more precise way to measure their effect should be found. Also, as their effect often takes place after a while, it might be that the empirical part of the thesis should be redone in the future.

KEYWORDS: COVID-19, pandemics, macroeconomics, banking crisis, economic regulation

VAASAN YLIOPISTO
Laskentatoimen ja rahoituksen yksikkö
Tekijä: Panu Hallamaa
Tutkielman nimi: The appliance of macroprudential instruments to ease the financial distress caused by COVID-19 : A global summary of the year 2020
Tutkinto: Kauppatieteiden maisteri
Oppiaine: Taloustiede
Työn ohjaaja: Panu Kalmi
Valmistumisvuosi: 2022 **Sivumäärä:** 100

TIIVISTELMÄ:
Siitä on melkein kaksi vuotta, kun ensimmäiset Koronavirustartunnat raportoitiin. Siitä lähtien sillä on ollut valtavat humanitaariset sekä taloudelliset vaikutukset. Talouksia ympäri maailmaa on suljettu hetkellisesti, minkä takia negatiiviset shokit ovat olleet arkipäivää. Edes kehitetyt rokotteet eivät anna vielä varmuutta siitä, milloin pandemia loppuu. Parantaakseen talouksien kykyä kestää shokkeja valtiot ovat hyödyntäneet makrovakausmekanismeja. Kyseiset instrumentit olivat pitkään unohtuneita, mutta Euroalueen velkakriisi nosti ne takaisin valvojien mieliin. Makrovakausmekanismeja hyödynnetään järjestelmäriskin hallinnassa. Järjestelmäriski voidaan jakaa sykliseen ja rakenteellisen, riippuen siitä, mihin järjestelmän osiin riski on kerääntynyt. Useampi ylikansallinen organisaatio, kuten International Monetary Fund, tekee yhteistyötä kehittääkseen makrovakaudellista säätelyä. Säätelyä tapahtuu kolmella eri tasolla: kansainvälisellä, unioni- ja maakohtaisella tasolla. Havaitakseen järjestelmäriskejä markkinoilta on kehitetty ennakoivia systeemejä, jotka antavat lainsäätäjille mahdollisuuden toimia. Niiden perusteella määrätään makrovakausmekanismeja, jotka voidaan jakaa kolmeen osaan. Ne ovat luotonantoon, likviditeetiin ja pääomaan liittyvät instrumentit.

Nykyisessä makrovakausmekanismeihin liittyvässä tutkimuksessa on ongelma. Se ei tällä hetkellä tarjoa tietoa siitä, kuinka hyvin instrumentit auttavat elvyttämään taloutta kriisissä. Se on sinänsä ymmärrettävää, sillä ne palasivat käyttöön viimeisimmän suuren finanssikriisin jälkeen. Pandemia kuitenkin tarjoaa meille mahdollisuuden tutkia asiaa siltä kantilta. Tutkielmassa tutkitaan 47 maan dataa hyödyntäen usean selittäjän lineaarista regressiota. Tavoitteena on selvittää, onko aktiivisesti makrovakausmekanismeja hyödyntäneet maat selvinneet paremmin pandemian aiheuttamista ongelmista kuin epäaktiiviset. Valitettavasti empiirinen tutkimus ei kykene löytämään tilastollisesti merkittävää riippuvuutta. Se ei kuitenkaan tarkoita, etteivätkö makrovakausmekanismit toimi. Täytyy löytää tulevaisuudessa toinen näkökulma tai tutkia niitä toisenlaisella metodilla. Makrovakausmekanismit vaikuttavat nimittäin usein viiveellä, joten on mahdollista, ettei niiden vaikutus siksi näy. Myös ne pitäisi määritellä selkeämmin, sillä tällä hetkellä määrittely vaihtelee huomattavasti lähteiden välillä. Jos ne nähtäisiin yleismaailmallisesti samalla tavalla, on varma, että niiden havainnointi muiden taloudellisten päätösten seasta helpottuisi.

AVAINSANAT: COVID-19, pandemia, makrotalous, pankkikriisi, taloudellinen säätely

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Abbreviations

IMF	**International Monetary Fund**
OECD	**Organization for Economic Co-operation and Development**
GDP	**Gross domestic product**
ESRB	**European Systemic Risk Board**
FSB	**Financial Stability Board**
ECB	**European Central Bank**
SSM	**Single Supervisory Mechanism**
COVID-19	**Coronavirus disease 2019**
BIS	**Bank of International Settlements**
WAEMU	**West African Economic and Monetary Union**
NBFI	**Non-Banking Financial Institution**
US	**The United States of America**
LTV	**Loan-to-value ratio**
SII	**Systemically important institution**

1 Introduction and purpose of the study

On the last day of 2019, the World Health Organization (2020) announced that forty-four individuals were hospitalized by an unknown virus in China. By the June 8th, 2021, the same virus, Covid-19, had killed over 4 million people, and more than than 185 million cases were reported worldwide, according to "COVID-19 Map - Johns Hopkins Coronavirus Resource Center" (2021). The vaccination against the virus is underway, but the disease mutates continuously. Also, a significant amount of people are against the vaccines, which makes it impossible for experts to estimate when herd immunity will be reached, and life returns to normal.

When the pandemic started to spread, it was inevitable that the disease would affect more than just people's health. Following the legacy of David Ricardo's comparative advantage, the world's economy has become ever more interconnected, and as nations started announcing lockdowns, significant demand shock began. Also, many production chains momentarily broke as people were not able to work. The stop caused additional supply shock, which was significant. These shocks meant that the world's economy was under substantial turmoil. According OECD (2021) "Quarterly National Accounts : Quarterly Growth Rates of real GDP, change over previous quarter" only 2 out of 47 countries they follow reported growth on the second quarter of 2020 comparing the same period of the previous year and similar trend would go on until the end of the year.

Governments have many different ways to ease the negative phases of the economic cycle. Often a wide range of them is used as policy-makers want to minimize the loss of welfare. This thesis deals with macroprudential instruments that were long forgotten but re-emerged after the Great Recession, according to Galati and Moessner (2013). They discuss how the crisis revealed how financial institutions globally interlink with each other. As a result, distress on another side of the world can become rapidly domestic via shared assets.

Borio (2003) describes that the objective of macroprudential instruments is to maintain the soundness of the financial sector and make sure that the unsteadiness will not transmit to the real economy. The current pandemic is unique compared to previous economic downturns as it was impossible to reveal using developed indicators. Thus, it is now more about counterbalancing the situation as it evolved without a previously drafted plan. Due to its peculiarity, it is essential to study whether macroprudential measurements have helped ease the economy's current state.

So far, more studies discuss how well the macroprudential instruments can dampen the excessive lending and stabilize the growth so the bubble will not form. The thesis aims to study how well the measurements work if the downturn is already the current state of the economy. It will be studied using activity as measurement and comparing if more active users of macroprudential instruments have managed to survive 2020 with a slighter fall on annual gross domestic product. Also, the instruments are divided into different groups, as Lim et al. (2011) does it. By studying different groups, the aim is to see if different categories have worked better to mitigate economic distress. If the empirical study concludes significant differences, the discovery can help tackle similar situations if they occur again. Also, it could lead to more detailed research in the future.

Here are the research problems constructed as hypotheses:

1. Have macroprudentially more active countries suffered less from a GDP point of view than nations that have used fewer instruments?
2. Has the appliance of a specific group of instruments led to better results than others? The three categories studied are credit-, liquidity- and capital-related instruments.

The thesis divides into five different chapters. The first chapter discusses the theoretical background of macroprudential policies. The chapter aims to educate how the measurements have evolved and what they aim to prevent. It also discusses who is responsible for supervising and regulating them and viewing how their effect is often cross-national.

With the knowledge of this chapter, it is easier to understand how macroprudential instruments could help stabilize economies during the COVID-19 pandemic and why it is essential to study their use.

The second chapter first discusses what have been the economic effects of COVID-19 so far and how the economy will possibly recover from the instability. The next part of the chapter describes how nations screen to detect incoming financial distress. It is safe to say that indicators did not help distinguish the current situation as all used variables are economical. However, the indicators show which parts of the economy excessive risk embedded even before the pandemic. So if a more extensive crisis occurs, it is likely that those parts of the economy suffer too. It also displays what kind of instruments can help reduce the systemic risk that had built up in the economy. The instruments are divided into categories as it is easier for the reader to distinguish how different countries have faced the issue. Thus, it is crucial knowledge to understand the empirical research performed in the thesis.

The third chapter presents the framework of the empirical study. First, the methodology is explained utilizing the “Research onion” designed by Saunders, Lewis and Thornhill (2009). The method helps to understand the thought process that has taken place while planning how the research questions will be studied. Then the data that is used is discussed. The sources where the data was gathered and the validity and reliability of it are contemplated. Also, as some of the statistics are gathered from a written summary, a thorough consideration of limitations and possible misunderstandings is done.

The aim of the fourth chapter is to see if statistically significant findings can be done from the research questions. In it takes place the presenting of descriptive statistics of studied variables, and the hypotheses are tested using the Multiple linear regression model. However, all the findings from the database are not part of the empirical study. Only measurements that could be identified as part of a specific category were tested. Nonetheless, at the end of the chapter, there is a discussion of the other findings as they are

just as important. To finalize the chapter, a discussion and reflection of the findings occur. Also, it is thought what could be done differently while studying the subject in future. Lastly, there is a conclusive chapter that summarizes the thesis one last time.

2 Macroprudential policies

This chapter aims to discuss more thoroughly what macroprudential policies are. It is essential as they have just lately re-emerged to the repertoire of financial regulators, and they are not as well-known as monetary policies or fiscal policies. The knowledge will ease understanding the rest of the thesis. Also, it underlines why governments use such instruments to relieve the current distress.

2.1 Re-emerging of macroprudential policies

Kebler and Monnet (2014) state that macroprudential instruments were already in use after the second world war. However, due to the deregulation during the second half of the 20th century, their utilization diminished close to zero. Only after the Great Recession they re-emerged, as Draghi (2019) puts it. The Great Depression of 2007-2009 yet emphasized that supervision mainly executed at the microprudential level was inadequate. The need for economic-system-wide regulation grew distinct as the crisis became global in seconds through shared assets.

Galati and Moessner (2013) state that the danger of system-wide risk, systemic risk, was underestimated. Supervisors and regulators trusted that the economy would balance itself, and new financial discoveries entered markets without enough supervision. Bruni and Lopez (2019) prove that the institutions were also over-confident during that time. The confidence led to excessive leveraging and amplifying systemic risk. Also, the extent how the economic turmoil spread into the real economy was a significant surprise for everyone, according to Constâncio et al. (2019). They state it took years for countries to attain a similar level of welfare than before the crisis. The length of recovery was something the supervisors had not experienced for a long time.

Furthermore, it was not like all this could not have been predicted. Levy-Carciente, Kennet, Avakian, Stanley and Havlin (2015) conclude that financial distress can spread

quickly domestically. Even if microprudentially correct measurements were in use from 1998 to 2013, there were occasions when seemingly solvent institutions got into significant trouble. Dumičić (2017) points out that the business environment gets constantly more global. Countries are more dependent on foreign trade, and financial institutions acquire assets from foreign markets to diversify their risk level. Thus, turbulence in one country can become a global issue instantly. So financial institutions in Venezuela or any other country can end up in big troubles even if just before everything was just fine.

Bruni and Lopez (2019) state that after the Great Recession, the paradigm changed, and the need for macroprudential regulation re-emerged. The use of instruments has increased significantly since, as Akinci and Olstead-Rumsay (2018) conclude in their study. They study 57 countries, and figure 1 displays the macroprudential activity of the countries. The bars illustrate the use of macroprudential measurements in a quarter. The number of used instruments surged after 2007 when the collapse took place. Also, as the macroprudential view has become more popular, it has caught the attention of academicians. Dumičić (2017) discusses that significantly more studies have been done on the subject recently.

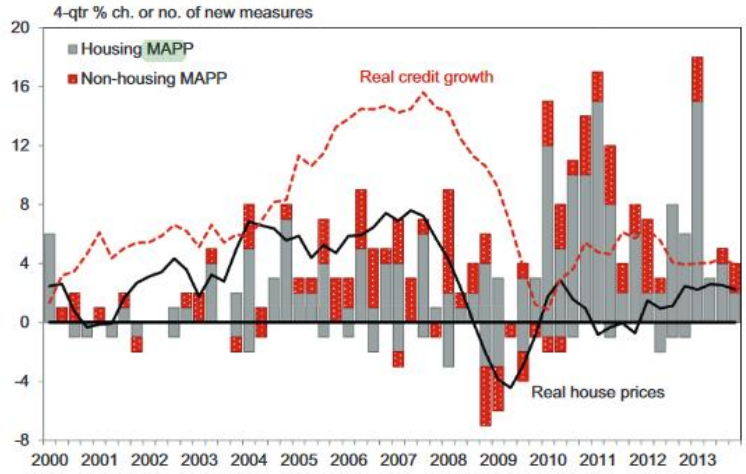

Fig. 2. Evolution of MAPP Use, 2000:Q1–2013:Q4. Note: The figure shows average real credit growth (dashed line) and average real house price appreciation (solid line) across all 57 countries. The dotted bars (solid bars) show the total number of new nonhousing-related measures (housing-related measures) introduced by all countries in our sample in each quarter. Positive (negative) values indicate tightenings (easings).

Figure 1 The use of macroprudential instruments in 57 countries studied by Ankinci and Olstead-Rymsay (2018.)

2.2 Macroprudential policy versus microprudential policy

To understand the thesis, it is vital to know the difference between macroprudential and microprudential policymaking. In a study, Borio (2003) provides a distinct comparison between those two presented in Table 1.

Table 1 Difference between macroprudential and microprudential (Borio 2003.)

Table 1

The macro- and microprudential perspectives compared

	Macroprudential	**Microprudential**
Proximate objective	limit financial system-wide distress	limit distress of individual institutions
Ultimate objective	avoid output (GDP) costs	consumer (investor/depositor) protection
Model of risk	(in part) endogenous	exogenous
Correlations and common exposures across institutions	important	irrelevant
Calibration of prudential controls	in terms of system-wide distress; top-down	in terms of risks of individual institutions; bottom-up

As table 1 illustrates, the microprudential regulation targets to hinder the economic difficulty of individual institutions. The macroprudential policies view the risk more extensively and aim to control the system-wide issues. From that view, the financial operators are one entity, and understanding the institutions' connectivity is critical. By looking at the shared assets and connections between the institutions, supervisors will understand better is there a risk for global crisis. Microprudential policies aim to enhance individual institutions' performance, and thus, the protection of an individual consumer is highly valued. In contrast, the macroprudential regulation aims to keep the nuisance away from the real economy. The object endeavors to maintain the steady growth of output and enhance welfare growth with a stable economic system (Borio, 2003.)

Different targets sometimes inflict contradictions between microprudential and macroprudential actions. For example, during financial distress, microprudential regulation would inform banks to cut on lending and lessening their risk weights. Thus, banks would

enhance their liquidity which would give them more resilience. The additional liquidity protects them in case the financial hardship continues longer. However, this may lead to a credit crunch, according to Bernanke, Lown and Friedman (1991). It is a situation where the banks restrict their lending while the interest rate and solvency of the potential borrowers remain the same. They add that the leading cause for this is mistrust between parties that had built up often because the economic situation is volatile. On the other hand, the macroprudential view emphasizes an effective financial sector that enhances the real economy. Hence from a macroprudential standpoint, credit crunch would be prejudicial for the economy and should be avoided. Due to this conflict of interest, the supervisors need to communicate and untangle the risks they are dealing with (Financial Stability Board, 2020a.)

To discuss more about the problems that the usage of the microprudential instruments cause for financial stability. Andrieș and Sprincean (2020) describe that the main problem with microprudential supervision is using the Value at Risk indicator. The indicator moves countercyclically, so it surges during the downswing and declines in boom phases. The countercyclicality enables financial distress to spread into the real economy as they will restrict the lending causing liquidity problems during downturns. However, Kurowski and Smaga (2018) conclude that microprudential policies are not the only procyclical regulatory measure. They study monetary policy actions of seven central banks, including the United Kingdom, Euro Area, The United States of America, and other advanced economies. The research data is from 1995-2015, and it concludes that over 50% of monetary actions intensify the boom phase rather than controls it. In a specific state of the economic cycle, this is reasonable. However, if timed incorrectly, monetary policy can lead to a surge the systemic risk.

Because of the preceding finding, monetary policies and their objects need to be considered when applying macroprudential measurements. Rubio and Yao (2019) discuss that especially when the interest rates are low, the communication between monetary supervisors and macroprudential supervisors is crucial. The discussion enables

maintaining the financial stability and so the welfare. Additionally, they claim that as the monetary policy becomes less efficient in this environment macroprudential instruments may help reach monetary policy goals. However, the researchers use a dynamic stochastic general model. To calibrate the parameter, they compare their model to the US economy from 1950 first quarter to 2007 fourth quarter. The prevailing economic state is notably different from the compared time, and it may affect the results.

Even if this chapter views the microprudential policies in a poor light, they still have great importance on financial supervision. The idea was to discuss why macroprudential instruments should also be considered when choosing the correct measurement. This discussion is even more difficult because it is sometimes complicated to distinguish if an instrument is applied from a microprudential or macroprudential premise. For example, many countries have applied a moratorium on consumer loans due to the Corona crisis, according to IMF (2021a). The decision may be seen as microprudential as it protects individual depositors. However, as Levy-Carciente et al. (2015) state, the great recessions revealed that banks are ever more connected. A significant surge in insolvencies may cause a bank sector-wide distress, and by applying a moratorium, both parties have more time to neutralize their circumstances. Thus, the decision would be from a macroprudential point of view. Next, it is time to discuss the objects of macroprudential policies.

2.3 The object of macroprudential policies

This chapter discusses the risks macroprudential instruments face and what are their goals. The object of macroprudential policies is to bound the systemic risk and enhance the durability of the financial sector to endure possible turmoil. Firstly, it aims to do it by smoothing the financial cycle and preventing the evolvement of volatile booms and busts, which stabilizes the economy. Secondly, it aims to monitor the financial sector to maintain its soundness in the long run. If significant changes happen, such as a single institution becomes too prominent by size or interconnectedness, more supervision is

required. Otherwise, its problems can cause significant troubles for the economy (Constâncio et al., 2019; Huang et al., 2010.)

Reaching the object is not as simple nowadays as everything is interconnected, which will be discussed more in upcoming chapters. However, there is an issue that is always present when making macroprudential decisions. It is the inaction bias, according to European Systemic Risk Board (2018). They state it occurs because macroprudential instruments, especially restricting ones, cause immediate expenses, but their positive effects can occur after a long time. Thus, the financial markets are often against the decision and prefer the current state. ESRB (2018) writes that the resistance can lead to slow or non-existential decision-making by the supervisor. However, the following chapters will explain why the bias must not affect the decision process.

2.3.1 The systemic risk

The systemic risk is the risk of the whole economic system. It is the combination of all the risks that lie in the financial sector. In an article, Schwarcz (2008) describes systemic risk as a type of risk that requires a trigger event. After a debt bubble bursts, an institution fails, or an unexpected event occurs, a significant chain reaction takes off. In the worst case, through the interconnectedness, the distress spreads globally, causing simultaneous global turmoil. Kaufman and Scott (2003) approach it as a probability for systemwide distress versus crisis of singular institution. The view is similar to macroprudential versus microprudential that was discussed previously in the thesis. Huang et al. (2010) state that the connections between institutions are one of the main focuses when studying systemic risk.

To understand why it is crucial to hinder the accumulation of systemic risk, one can look at how a global financial turmoil can negatively affect economies for years. Figure 2 provided by the European Central Bank's (2021) macroprudential projection illustrates possible recovery paths of euro countries following the financial distress caused by COVID-19. Even with the mild scenario, it takes nearly two years to accumulate similar welfare

than before the crisis. With a severe scenario, it would take more than four years, which does not include the welfare gain that would have taken place without the crisis. The loss of welfare displays how long-lasting effects unexpected events can have on the global economy and why it is essential to prevent them if possible.

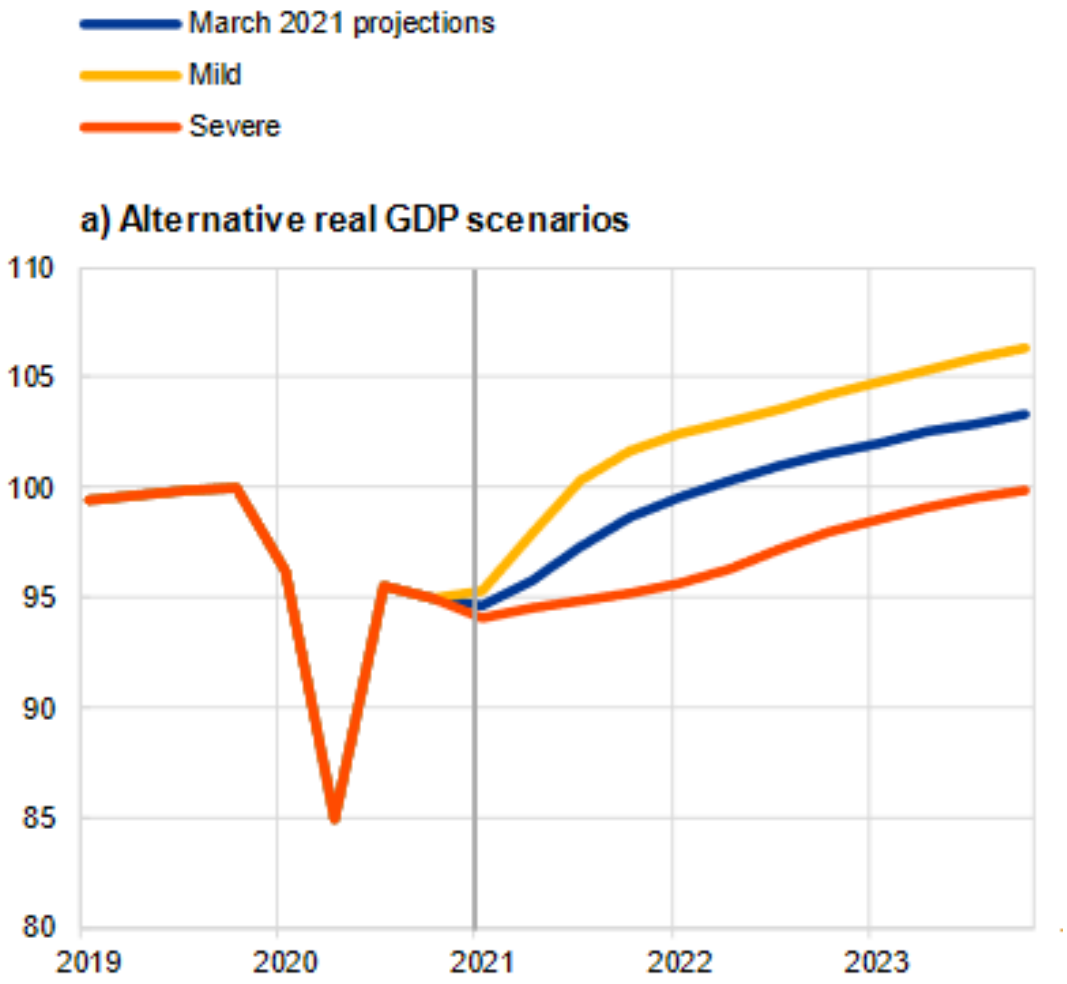

Figure 2 Alternative GDP recovery scenarios by European Central Bank (2021a.)

Thus, the issue with predicting the outcome of systemic risk is not only how to estimate the severity of the effect. It is also crucial how long it takes for countries to overcome the hardship. In an older macroprudential projection written in March 2020, the European Central Bank (2020b) underestimated the economic effects the COVID-19 would have on Euro countries. Even as the virus was already spreading in Europe, the general

expectation was that the situation would be under control in few months. As a result, the expected effect on welfare was that growth would slow down only for the first two quarters of 2020. Furthermore, the last two quarters would have patched the losses by the end of the year.

The Systemic risk can be further divided into two main categories by how it accumulates in the economy. According to Finnish Financial Supervisory Authority and Bank of Finland (2020), the risk can be structural or cyclical. Both entities can still be divided into more precise indicators as the Bank of Finland has fourteen of them, found in appendix 1. There are also other ways to categorise the premise of systemic risk. If the risk evolves from the unsteadiness of the financial sector itself, it is endogenous, as happened in the Great Recession. Thus, it can also be exogenous if the turmoil emerges from outside the banking sector from which pandemic caused by COVID-19 is a great example. The systemic risk can be cyclical, time-varying, or surge from a structural or cross-sectional source, such as the interconnectedness of financial institutions. The next chapter will present the structural form of systemic risk (Constâncio et al., 2019.)

2.3.2 Structural systemic risk

Structural systemic risk refers to vulnerabilities built into the financial sector itself, states Gramlich and Oet (2011). A unifying factor of structural risk indicators is that they are calculated using relative values. For example, one is a size of a bank compared to the whole financial sector. The two most well-known examples of these weaknesses are *Too big to fail* and *too connected to fail.* The former refers to a situation where an institution is so dominant that it creates three significant issues for supervisors to deal with, according to Goldstein and Veron (2011). Here are the three risks:

1. The institution becomes so substantial that it may endanger the financial sovereignty of its home country if it fails. If the bank understands they are in such a position, it may lead to increased risk-taking. This is because the bank assumes

the government would rescue them in case of financial distress. This excessive risk-taking is also a great example of a moral hazard.

2. They impair the competitive situation between the institutions. For example, their funding is cheaper than for smaller banks.
3. They reduce the consumers' trust in financial markets.

The *too connected to fail* institutions were discovered after academicians understood that not only giant banks can undermine the financial sector. Crucial, but sometimes smaller, institutions may have spread extensively around the financial sector and share assets with multiple other banks. Sometimes, the agent can operate beyond the banking sector as more financial activities are constantly taking place in non-banking sectors. It is because the non-banking sector does not have similar regulations compared to the banking sector. It is often more relaxed (León, Machado, Capeda & Sermiento, 2011.)

However, the structural risk may appear otherwise than just in such extreme cases. Supervisors globally follow domestic indicators to adjust the state of the economy. In Finland, the Bank of Finland has five different indicators they follow and report in a biannual macroprudential report. The indicators are relative and compare either the indebtedness or residential prices to different variables. They are good as indebtedness and housing prices directly affect the real economy (Finnish Financial Supervisory Authority & Bank of Finland, 2020.) In case of an unexpected inflation surge, the central banks are forced to increase the interest rate. Thus, some people would not be able to repay their loans leading to insolvency and imbalance in the financial sector. According to Virtanen et al. (2017), indicators are creditable for predicting the possible turmoil. However, indicators will be discussed more thoroughly in chapter 3.1.1.

2.3.3 Cyclical systemic risk

Before discussing the term cyclical systemic risk, it is crucial to explain the business cycle as they are so closely related. A business cycle can be divided into phases. In the first part of the cycle, the gross national product expands. After an unfortunate event, the

momentum shifts, and the GDP keeps decreasing until the recovery starts again. Thus, once the previous cycle is completed, the next one begins. The cycles keep repeating after one and another creating a sequence that constructs the accumulation of our welfare. However, the length of the cycle is irregular making it troublesome to predict how long the current will last (Burns & Mitchell, 1946.)

In their article Andrieș and Sprincean (2020) study how the cyclical systemic risk varies during the business cycle. They study 787 banks from 36 OECD and EU countries with a timespan of 1st quarter of 2000 to 4th quarter of 2017. The studied interval includes multiple financial distresses in recent histories, such as the dot-com bubble. Additionally, the data includes globally and other systematically important institutions, which are the most important from the perspective of systemic risk. The study concludes that the cyclical systemic risk increases during the boom phases of the business cycle. Additionally, the interconnectedness of financial institutions surges during the upswing and lowers during the downturn.

One way to tackle the growth of cyclical systemic risks is to build capital buffers into banks' balance sheets during the upturn. Figure 3 by the European systemic risk board (2014) illustrates the measure. Building a buffer during the upswing gives the institution a possibility to release them during a downturn. This way, the negative effect that could spread into the real economy is smoothened, and the welfare loss is reduced. Another report by the European systemic risk board (2018) states it is crucial that the buffers are controlled and supervised at the government level. The report presents multiple different buffers, such as countercyclical buffer. They are utilized to provide adequate protection compared to the systemic risk they inflict on the markets. The buffers and other instruments are discussed more precisely in chapter 3.2.

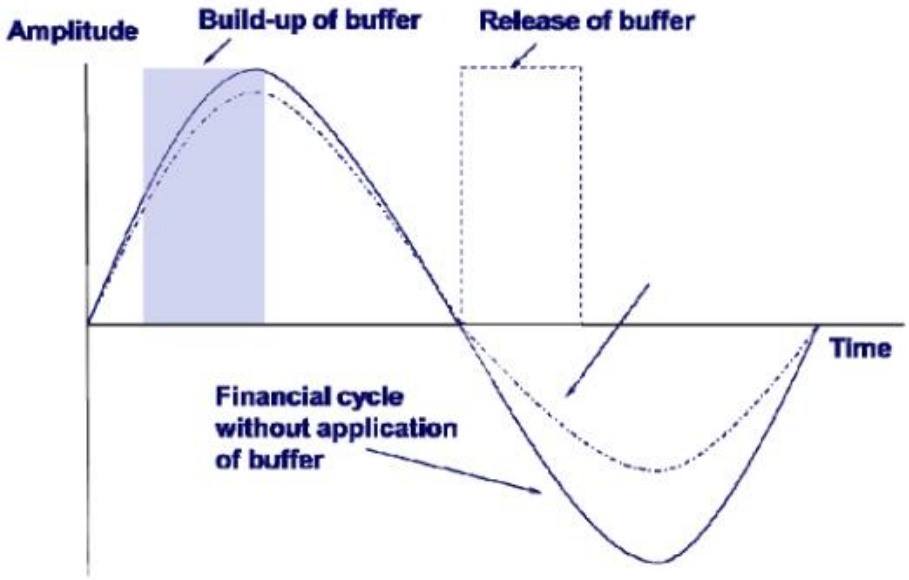

Figure 3 Use of buffers during the financial cycle. European Systemic Risk Board (2014.)

A study by Aikman, Nelson and Tanaka (2015) compares the difference in how macroprudential instruments affect cyclical systemic risk if an institution is well-performing or fragile. The hypothesis it uses is that when the economy is on an upswing of the cycle, many weaker banks will take excessive risks to boost their profits. The risk-taking conceals the current actual state of their business. Aikman et al. (2015) present the model to discuss the problem by dividing the banks into high ability banks and low ability banks. The high-ability banks can provide good returns without gambling. However, the low-ability banks need to take high risks to gain similar income according to the three-step decision tree applied in the study. The researchers conclude that by applying countercyclical capital requirements, risk-taking can be reduced. As a result, it becomes more expensive for less capable banks to take risks, whereas more capable banks are not affected. This fact lowers the issues with excessive risk-taking and reduces the self-amplifying effect of economic upswing. Constâncio et al. (2019) write that households have similar tendencies and are more risk-seeking during the boom phase.

The economic turmoil caused by the pandemic is definitively cyclical as it started from an unexpected event and not from a failure of a structure. However, sometimes events

that start as cyclical can trigger risk that has accumulated in structures and exacerbates the crisis. So far, this has not been the case in this distress as the governments have taken significant actions to ease the position of individuals and companies. However, this can still change as the measurements and unstable situation have swollen countries' and individuals' debt burdens. The increased indebtedness is something that needs to be taken into consideration when making future decisions. This chapter discussed the risks that macroprudential measurements try to dampen and how they would affect welfare. The next chapter will discuss that who makes the decisions on which instrument is applied and why.

2.4 The regulation framework

As the macroprudential instruments re-emerged not so long ago, the regulatory framework is still under construction. However, depending on the country, there are two or three levels of operators which provide research and proposals to the country's legislators. In a global view, the supervisory levels in descending order are international, in some cases union, and finally domestic. This chapter provides a better view of the operators at different levels and how they contribute to macroprudential regulation. Understanding the framework is crucial in understanding the empirical part as nearly all of the decisions are made at the domestic level but also some at the union level.

2.4.1 International co-operation

There are three main agents at the international level: Bank of International Settlements, Financial Stability Board, and International Monetary Fund. They all have a somewhat different role in constructing the framework. However, they are not just working individually. The institutions co-operated twice, 2011 and 2016, to write a report Elements of Effective Macroprudential Policies by Committee on the Global Financial System (2016) to improve the framework of macroprudential regulation. They have produced two documents that have discussed the current state of the framework and how the appliance

of macroprudential instruments has evolved globally. Both documents are created by request of G20. Next, we will discuss in more detailed the role of each institution. First, we discuss the role of the Bank of International Settlements, which is the most extensive.

Being the oldest international financial institution in the world, the BIS connects 63 central banks around the world. The organization tries to obtain monetary and financial stability at the international level while promoting knowledge sharing among the central bankers. The sharing enables the development of macroprudential policy. What distinguish BIS from FSB and IMF is that it evolves the banking regulation via Basel Process. As macroprudential policies are banking regulations, BIS establishes an internationally agreed standard for the level of operation. Decisions of the committee are internationally binding, and they will be implemented separately into the legislation of each member country (Bank of International Settlements, 2021a; Bank of International Settlements, 2021b.)

However, the macroprudential view has not always been at the core of Basel regulation. Basel III was the first regulation specially designed to endorse the fight against systemic risk in financial institutions. It states that in calculating the capital requirements, the risk of the whole banking sector should be considered. Also, the countercyclical buffer was presented, and more importance was given to clarifying the systemic risk of an individual institution. The previous agreements, Basel I and Basel II, were developed in a more microprudential mindset concentrating on the stability of individual institutions. Baker (2013) states that the reason for this paradigm change was the Great Recession which had a lot to do with non-banking financial institutions and their complex financial instruments (Levy-Carciente et al., 2015; Borio, 2011.)

Even if Basel III was a significant improvement to global macroprudential regulation, some flaws were identified after its implementation. To fix them, Basel IV was introduced. It focuses on instructing how Basel III should be applied more than being a regulatory framework itself. Basel IV aims to standardize the method applied globally. The

regulation involves, for instance, how individual banks should calculate their capital requirements and how their capability of absorbing loss is valuated (Amorello, 2016; Koch, Schneider, Schneider & Schröck, 2017.) Having a unified formula for calculating the requirements and valuations enables a more accurate calculation of risk levels. More precise calculations lead to better regulatory and supervisory actions on the macroprudential level. Next, the Financial Stability Board is presented.

The role of the Financial Stability Board is more political than BIS, as the G20 countries found it in 2009. However, since 2013 it has been an independent non-profit organization that reports its findings periodically to the leaders of G20 and their Finance Ministers and heads of their Central Banks (Financial Stability Board, 2021b.) It has similar objects with BIS as it conducts research and draws guidelines for the future development of international financial markets. Financial Stability Board aims to enhance financial stability at the international level, and as Krishnamurti and Lee (2014) state FSB has a significant role in building the framework for macroprudential policies. The most significant difference between BIS and FSB is that FSB's agreements do not bind the member countries legally. The implementation process of the standards relies on mutual trust and commitment of the involved countries (Financial Stability Board, 2021a.) This can be seen as an effective way as often less developed countries thrive to follow the methods of more advanced economies. The last institution presented is the International Monetary Fund.

Like the previous two, also the IMF does much research concerning the macroprudential policies. Additionally, it conducts an Annual Macroprudential Policy Survey that studies the measurements its member countries have applied. Such research is vital as with the data, the effectivity and recognition of macroprudential measurement can be boosted at the global level. The data is also stored so anyone can retrieve it. According to Bruni and Lopez (2019), the IMF has an essential role alongside the World Bank in helping the emerging economies apply macroeconomic regulation. The organizations help the countries with introducing the standards and directs on establishing adequate supervisory

mechanisms. This way, the emerging economies can diminish the development cap towards the advanced economies, enhancing the international economy. The World Bank is not separately introduced in this thesis as their role in other than emerging countries was complicating to verify. The next step from the global level is the union level that only concerns some of the countries.

2.4.2 Union level regulation and supervision

There are two unions active at the macroprudential level: the European Union and the West African Economic and Monetary Union (WAEMU). A mandate that the unions have is to guide the macroprudential policy differs significantly from each other. For example, the only macroprudential instrument the WAEMU can order is the reserve requirement ratio, according to Imam, Kolerus, Bernard, and Kireyec (2013). International Monetary Fund (2013) adds that WAEMU guides the implementation of Basel regulation to its member states, being Benin, Burkina Faso, Côte D'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo.

In EU regulation, multiple institutions are working alongside to provide resilience to the economy. According to European Parliament (2017) briefing, there is the European Systemic Risk Board which covers the whole of Europe. Its task is to coordinate the policies and give warnings if it notices flaws in how member country acts. Lastly, it is entitled to perform stress tests to examine the state of financial institutions in Europe. However, its actions are non-binding, and it relies on peer pressure between the nations. There are also European Central Bank and Single Supervisory Mechanism that guide the actions of governments and financial institutions. The role of the Single Supervisory Mechanism is to enhance the stability of the European banking system, guiding 115 most prominent banks in the area while smaller ones are under domestic supervision, according to European Central Bank (2021c). The mechanism accomplished standardized courses of action and supervision while overseeing the implementation of new banking regulations. All the countries must apply it similarly because it makes the supervision more convenient (European Parliament, 2017; Constâncio et al., 2019; European Central Bank, 2021.)

The macroprudential instruments are vital for euro countries, and here is why. Constâncio et al. (2019) explain that as the nations have joint monetary policy, the macroprudential instruments allow countries to react to domestic issues with their own will. It is because domestic institutions make most of the macroprudential decisions in Europe. For example, if the EU's interest rate is too low, the country can reduce the money supply by increasing banks' capital buffers. The European Central Bank only monitors the appliance of macroprudential instruments in member countries. They especially pay attention if there is a distinct possibility to cross-border spillover and thus the domestic systemic risk spreads. The ECB also constitutes instructions on applying specific measurements with Capital Requirements Regulation and Capital Requirements Directives (Constâncio et al., 2019; European Systemic Risk Board, 2018.)

To ease their monitoring work, union-level institutions often require notice before member state implements an instrument. Depending on the dimension of the act, either European Central Bank, European Systemic Risk Board, or European Commission needs to be informed according to European Systemic Risk Board (2018). The fact that the country presents the decision to a union-wide institution has its pros and cons. As a pro, a more comprehensive view on how the decision will influence the economy at a Europe-level is drawn. Additionally, as the country informs the appliance of an instrument at a higher than domestic level, the news will spread to a broader audience such as investors. A minor downside is that it will delay the implementation of the instrument. However, as Virtanen et al. (2017) conclude, the warning signs of systemic risks should be noticed multiple quarters before the bust.

2.4.3 Country-level regulation and supervision

The final decision-making in macroprudential regulation takes place at the country level, where the regulators make decisions according to the country's domestic needs. However, as the Macroprudential Policy Survey completed by International Monetary Fund (2018) concludes, the practices that oversee the regulation differs notably between the countries. Different decision-maker agents are:

1. Central bank
2. Committee within the central bank
3. Committee outside the central bank
4. Supervisory agency
5. Committee outside the central bank and supervisory agency
6. Other authority
7. No designated macroprudential authority

According to the survey, Central banks is the most common regulator in emerging and developing but also in advanced economies. Nearly 35% of the countries have multiple authorities dealing with the regulation, some up to four. However, even if a single authority makes the decision, it does not mean that one official concludes the decision process. The Finnish Financial Supervisory Authority (2018) states that the Board of the Finnish Financial Supervisory Authority oversees the country's macroprudential decision-making. However, it makes decisions only after hearing the Bank of Finland, Ministry of Finance, and Ministry of Social Affairs and Health. For example, the Bank of Finland (2020) gathers and analyses the current state of the domestic economy. By analyzing alterations that have taken place, it can inform the board how the systemic risk evolves. Finnish Financial Supervisory Authority (2018) emphasizes that various viewpoints are taken into consideration by hearing multiple bodies. Thus, it enables the most comprehensive decision-making. The last notable finding by the IMF survey is that by 2018, more than a quarter of emerging and developing economies lack a designated macroprudential authority, whereas, for advanced economies, the number is less than 6% (International Monetary Fund, 2018.)

During the pandemic, nearly every individual decision has been made by a domestic institution. There is only one exception: when European Central Bank (2020a) instructed that the banks of member states should not pay dividends. Thus, the banks would concentrate on staying solvent and maintaining the real economy. As the importance of the

global and union level framework was minor during the pandemic it is essential to justify why they were presented in this thesis. Firstly, the regulatory frameworks place a significant role in how any of the implemented instruments were applied in the first place. Second, the pandemic can shift the build of the framework and what it aims to supervise. The COVID-19 reminded the global economy that non-economic incidences can have a major impact on the economy. This learning is something that should be monitored more carefully in the future. As the regulatory framework is now discussed, it is time to look at how nations currently communicate their measurements.

2.5 Communication of macroprudential policies

Just as with other financial policies, communication is a crucial part of the implementation of macroprudential regulation. By only announcing that macroprudential regulation will change, financial institutions and consumers can start acting differently. Also, by communicating, macroprudential regulators enhance their accountability. For example, publishing an annual report informs the public that the prevailing situation is monitored, and a written statement helps to clarify the appliance of instruments (European Systemic Risk Board, 2018.) Furthermore, communication has been critical during the pandemic as the decisions have often taken place in a tight schedule. Also, it has been important that all the suffering companies and consumers know what kind of help will come in the future.

To communicate effectively, the message needs to be transparent and consistent, which minimizes adaptation costs of macroprudential adjustments. Additionally, the regulator needs to make sure the message is well-timed with explicit and suitable content. Finally, it is essential to consider who are the correct recipients for each message. Patel (2017) explains that in some situations, it is better not to communicate publicly. If the inferior state of a financial institution is announced publicly, it can cause more troubles than do good for the economy. A great example of inadequate and inconsistent policymaking compared to what is communicated is seen in the study of Tillmanns (2015). He studies

the impact of unexpected alteration of loan-to-value and debt-to-income levels in the South Korean Economy. The data is from the International Monetary Fund and Bank of International Settlements covering the third quarter of 2002 to the second quarter of 2011. As figure 4 illustrates, the unexpected alteration had a significant effect on the economy. The residential prices took seven quarters and credit growth more than eight quarters to return to the levels before the changes. However, he adds that inconsistent communication can be used with good intentions. If the regulator is looking for a rapid change, they perform unexpected changes to instruments. (European Systemic Risk Board, 2018.)

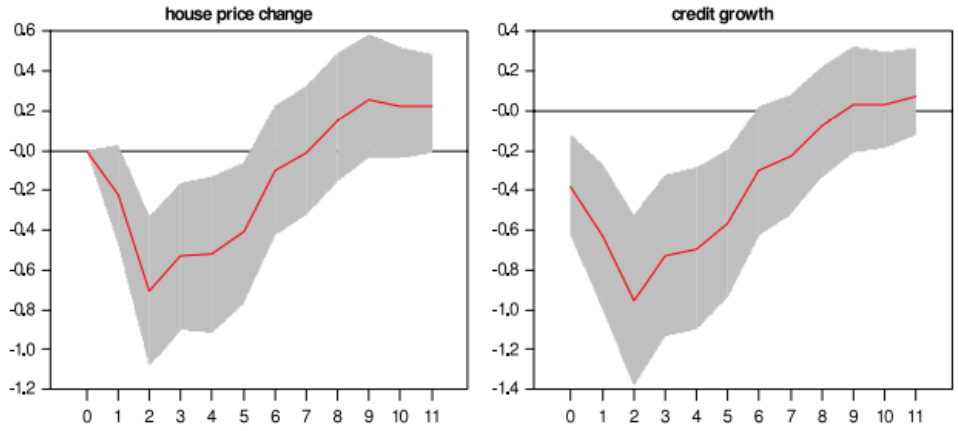

Fig. 2. Macroprudential policy shock in Korea (BIS data, total credit).

Figure 4 Macroprudential shocks caused by inadequate communication (Tillmanns, 2015.)

However, there are two issues with either the study or its result. Firstly, the data contains only information from South Korea, so the results may vary if the sampling would be more extensive. Secondly, one could articulate that unexpected shifts should diminish credit growth and housing prices. However, if the communication before the appliance of the instruments had been consistent, relative and distinct, the changes would still happen. They would not just be as radical as with inconsistent communication.

Before the communication becomes public, the regulator needs to take multiple steps. First, the institutions in charge of the decision-making discuss internally what they want to do. In Finland, that means the Bank of Finland, Finnish Financial Supervisory Authority, Ministry of Finance, and Ministry of Social Affairs and Health share their thoughts. The next step is to make the dialogue public, so more opinions are attained. Before the decision is implemented, a cross-border discussion takes place. Countries or multinational institutions discuss if the regulation will affect other countries negatively. As the country justifies its reasoning, the focused communication to the public can take place. In public communication, multiple channels are capitalized to have the broadest reach possible. A journalist will most likely have a different source for information than institutions. Thus, for each channel, the communication should be revised according to its readers' expected level of knowledge. As if people will not understand the statement, it has no purpose (European Systemic Risk Board, 2018; Finnish Financial Supervisory Authority, 2018.)

Moreover, the communication of macroprudential instruments is still often an issue. According to the Committee of Global Financial system (2016), macroprudential regulation is still such a new phenomenon that only a few recipients of the information understand it. Dumičić (2017) states that there are also problems in communication between countries before the implementation of a policy. According to her, many of the spillovers caused by policies could be prevented with better communication. Also, a significant issue with the appliance of macroprudential instruments is that often they have an immediate negative impact and the positive side, such as economic prosperity, follows after a while. Expressing the cause of the lag is complicated, and sometimes it is even impossible to prove the exact positive impact. It causes a significant problem to macroprudential communication during boom phases when the regulation is tightening. To the public, the macroprudential supervisors' actions seem superfluous (Patel, 2017; Toivanen, 2021.)

A long-term goal for macroprudential supervisors and regulators could be to make sure their voice would be heard and understood by more people. For example, during the

current pandemic, the changes in macroprudential measures have not found their way to the newsfeed. Mervi Toivanen (2021), a Head of the Macroprudential Policy Division in the Bank of Finland, states that only a few regular people understand the actual effects of the instruments. Receiving broader attention than just the financial institutions would significantly enhance the effectiveness of the measurements. What is also a problem according to her is that restricting policies receive almost always negative feedback but easing rarely. It is reasonable as former measurements often restrict how banks can operate but still more neutral communication would be beneficial to the subject. The Bank of International Settlements (2018) studied the use of the word macroprudential in public outputs. The result was alarming; the use has been decreasing since the Great Recession. In the worst-case scenario, the loss of interest can lead to a situation where macroprudential policymaking returns to the same level as before the 07-09 crisis over time. Next, it is time to examine the spillovers which can occur when an instrument is applied.

2.6 Spillovers and shadowbanks

2.6.1 Spillovers

As mentioned earlier in this thesis, the interconnectedness of banks increases constantly. To illustrate these current connections between European banks, see picture 1 by European Systemic Risk Board (2021b). It is from a report created using data from European

Figure 5 Connectivity of European Banks (European Systemic Risk Board, 2021b.)

Central Bank. The picture illustrates how banks in nearly every EU country are connected directly or through another country. However, this is not only a European trend, but it also takes place at a global level. In their research, Berrospide, Correa, Goldberg and Niepmann (2016) examine the US banks. If the macroprudential regulation is restricted in another country, it will expand the lending from US banks, proving the cross-border spillovers exist. Cerutti et al. (2015) study the matter at a more general level and conclude that cross-border lending amplifies when a macroprudential instrument is applied.

In Europe, they try to diminish the adverse effects by mandating a Single Supervisory Mechanism to overlook the macroprudential decision. This way, not a single country is fully responsible, but a multinational organization is helping on the way, says Constâncio et al. (2019). This kind of help has been significant during the pandemic as many decisions have been made in a hurry. Moreover, when SSM has taken care of the big picture, European countries have concentrated on balancing their economy.

As now it is proven that the spillovers occur, it is good to look at how they take place. European Systemic Risk Board (2018) summarize five ways in their article how they can take place:

1. *Cross-border risk adjustments*: The risk transfers via financial markets by foreign loans and funding. The transfer may occur after restricting the loan-to-value ratio or sectoral capital requirements as the borrowers look for more favourable funding. It may also occur if the home market is inefficient but international markets are willing to provide capital.
2. *Network formation and potential for contagion:* It concerns especially financial connectivity between financial institutions. Macroprudential instruments may shift the interbank lending as the requirements for buffers change. Also, instruments affect asset prices. Moreover, these changes affect each bank's portfolio individually and generate more heterogeneous portfolios as every institution has similar investments.

3. *Regulatory arbitrage*: This divides into two. It refers to banks' means to transfer assets and liquidity to countries with loosened regulation. The channel also includes shadow banks or non-bank financial institutions (NBFI). As they are non or a little regulated, the institutions can operate more freely and significantly impact systemic risk.
4. *Altering the effects on credit conditions:* The channel includes the relative cost of lending and the adjustment of lending terms. It is closely related to monetary and microprudential policies, as with macroprudential, both can be either supported or undermined.
5. *Trade effects:* Macroprudential instruments can affect the price of goods. For example, sectoral capital requirements can restrict companies' capability to get loans and force them to reprice their products. Thus, it can alter the competitive situation prevailing in the market.

Different spillovers can also be categorized in two ways. The first way is that they can be either inward or outward. Inward means that foreign financial institutions utilize regulatory differences in their operations. These actions are something that might have taken place during the corona pandemic. When distress started, consumers might have loaned from neighboring countries to balance their economic situation. Outward spill refers to a situation where a decision of one country affects others and may require adjustments from them (European Systemic Risk Board, 2018.) Most of the spillovers are positive. Restricting measures also diminish the overall level of systemic risk, and if two countries are in a slump loosening the restrictions help both. Negative spillovers often happen if countries are at a different phase of the economic cycle. For example, if a country starts constricting its regulation, companies and individuals may start to borrow from neighboring countries if regulation there is loosen. Ireland could be a great example to study this phenomenon in future. When other countries have been suffering, the economy of Ireland has kept growing, and thus they have kept loosening their policies. Could there be evidence that all this accelerated the leveraging of Irish institutions? Next, the non-

banking financial institutions shall be discussed, and their role is explained from a macroprudential point of view.

2.6.2 Non-banking financial institutions

Macroprudential measurements do not only affect commercial banking institutions. There is a parallel sector of non-banking financial institutions. They are not part of the general banking regulation. When the capital regulation of commercial banks is restricted, the lending shifts towards them. Because NBFIs finance their activities by lending money from financial markets and not with deposits, they use significant leverage in their operations. Also, the institutions do not have a chance to retrieve money from central banks. Their actions can lead to the growth of welfare as more innovative ideas will receive financing. However, if turmoil takes place, they are quickly in trouble due to the high leverage. The overall shift in welfare depends on to which extent they get into trouble and how badly their problems shake the whole financial system (Begenau, J., & Landvoigt T., 2016.) For this reason, the effects of macroprudential instruments need to be calculated carefully before application. Even if they do not directly affect NBFIs, restricting regulation can indirectly shift more lending outside the regulated markets. As a result, the change will lead to increasing systemic risk.

Before the Great Recession, non-financial banking institutions, formerly known as shadow banks, operated more or less under the radar. However, the crisis revealed that they have a significant role in the economy, and many think they need to be regulated like other institutions. Otherwise, it is complicated to maintain the soundness of the financial sector as 48% of the whole financial sector is not sufficiently regulated. Also, the growth of that part is increasing as the number was 42% in 2008. Regulation NBFIs would also be necessary because some of them are owned or operate in symbiosis with banks. Using NBFIs, banks can operate more freely than the regulation would otherwise let them. Furthermore, in case of distress, seemingly sound banks can end up in trouble if NBFI, which they own or have a lot of shared assets, defaults (Aldasoro, Huang & Kemp, 2020; Levy-Carciente et al., 2015.)

The role of non-banking financial institutions differs significantly in different countries. However, as advanced economies are the ones most involved in them, the turmoil can become quickly global if unrest starts spreading in the sector. Graph 6 from the study of Aldasoro et al. (2020) shows the global interconnections between NBFIs. Especially important is the role of the US. All the other players are significantly connected globally on both claims and liabilities. That is why getting regulation even to US markets would be necessary. In addition, the Financial Stability Board (2020b) states that out of European countries, especially Ireland, Belgium, Switzerland, Luxembourg, and the Netherlands, need to be closely supervised. Their contribution to the growth of systemic risk is prominent.

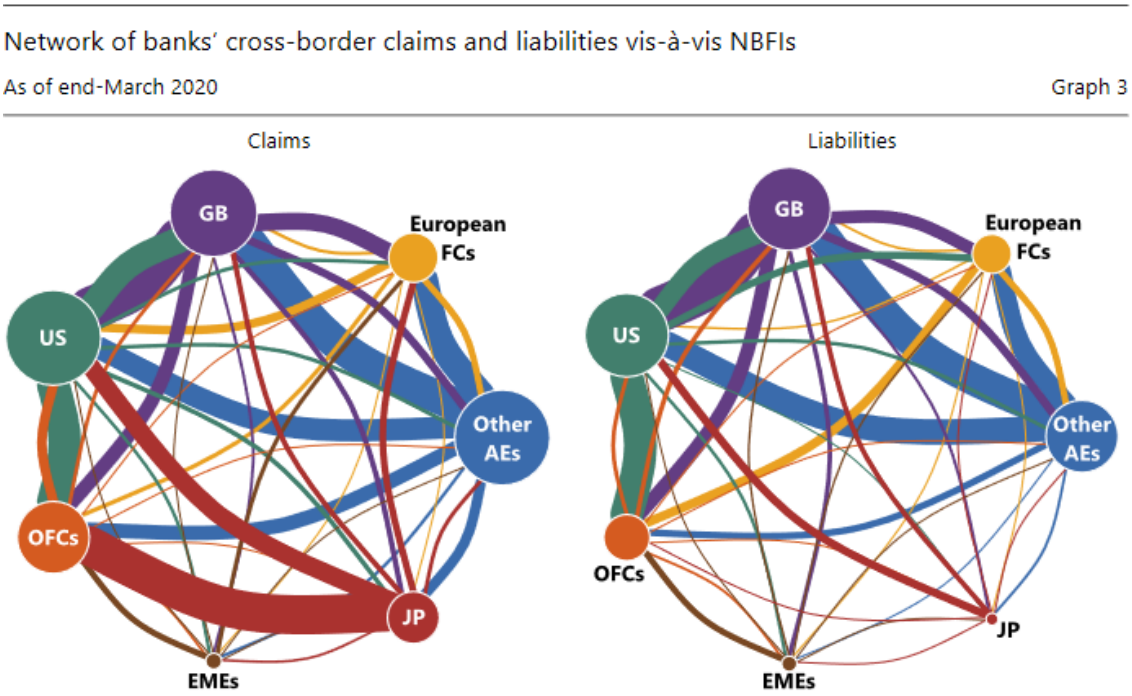

Figure 6 Cross-border networks of NBFI's (Aldasoro et al., 2020.)

Currently, there are two ways to reduce the current harmful cross-border transmission caused by NBFIs. Firstly, non-bank financial institutes should be regulated to some extent, most preferably to same than other financial institutions. Some might say that it would diminish the efficiency of financial markets as they are often more flexible than regular

banks. However, as the systemic risk among them cannot be entirely determined, they can create a “highway” for risk to spread, as happened before the Great Recession. Another way to reduce the negative transmission is to enhance the communication between countries. If countries hold too tight on their own strategy, they often miss what is best in the big picture. They need to be held more responsible for their decision and understand the viewpoint of others. This way, the efficiency of macroprudential instruments can be boosted (Aldasoro et al. 2020; Derviz & Seidler 2014.)

This chapter was the last one to discuss the theoretical framework of macroprudential measurements. In the next chapter, the focus moves towards the economic distress caused by COVID-19. Once it is examined, the chapter will explain how the excessive growth of systemic risk is usually detected. Then a closer look is taken at the macroprudential instruments that have already been part of the discussion.

3 Corona shock, indicators, and instruments

This chapter divides into three parts. First, we go briefly through what Coronavirus is and how the pandemic has evolved over time. To do that, we take a better look at how the health crisis has spread to the economy and examine some industries or nations that have suffered worse than others. Second, the indicators used to track the development of systemic risk are presented. The role of the indicators is different compared to previous macroeconomic crises as the shock was exogenous coming outside of the economy. However, the role of indicators in macroprudential supervision is crucial, and some have been alerting the supervisors even before Corona. Also, talking about the indicators provides an excellent opportunity to see where systemic risk currently is. Lastly, we talk about instruments that are applied to steer and stabilize the economy. The aim is to understand better the measurements, their prior use, effectiveness, and categorization. Also, some comments of how the nations have used the instruments during the crisis are made. It gives a better understanding before empirical research, which then can be understood more thoroughly.

3.1 Economic Turmoil of COVID-19

Predicting the length and severity of a pandemic is nearly impossible as its state alternates continuously. The virus evolves over time, and so far, it has had four main variants, delta being the latest, according to the WHO (2021). However, there are many new possible variants under investigation. Nevertheless, academics have tried to estimate the progress of the pandemic. In March (2020), Atkeson composed a model using susceptibility, infectivity, and recovery rate as variables and tried to predict the length of the pandemic. Using the Markov model, he came up with 12 to 18 months, which was too optimistic estimation by today.

The study of Atkeson (2020) also discusses social distancing and how the restrictions and lockdowns will balance public health and economic issues. He emphasizes that it is

essential to know how many people are simultaneously infected as it significantly affects the carrying capacity of universal healthcare systems. There is a notable difference if one percent of the population or ten percent of the population are simultaneously sick. In the latter option, it will be notably more demanding for the health care system to maintain enough staff working at all times. The issue will lead to more people receiving inadequate care. Furthermore, the insufficiency will inevitably lead to more deaths and induce a more significant threat to the economy. As more people are infected, more significant restrictions are applied, leading more people to lose their jobs. Many companies cannot handle the plummet in demand, so the real economy is highly affected by the situation.

3.1.1 Supply and demand shock

As previously mentioned, the economic shock COVID-19 has caused so far is very peculiar. In his study, Fernandes (2020) states that supply and demand shocks have co-occurred in the global economy so far. Kivistö (2020) agrees with the view adding that the supply shock occurred first, and the demand shock followed. The first supply shock started in China, where the lockdowns first occurred. There were notable delays on supply chains during the lockdowns as components and products could not be manufactured. Similar actions have occurred in multiple countries, as the summary of IMF (2021) displays. The lockdowns or quarantines have been appointed on many levels. IMF continues that some countries have applied them only for infected people, but in other countries, even the healthy individuals were affected. The lockdowns led to the demand shock as mainly the use of the service industry plummeted as people minimized their social contacts. However, after a year and a half, more demand and supply shocks have been alternating in the global economy. At the same time, neighboring countries might have been dealing with a completely different shock. Here are some possible scenarios to explain how different situations can be simultaneously in countries close by:

1. Country A is an advanced economy where the COVID-19 cases have been decreasing for a more extended period, and they are currently at low levels. The

country has loosened its restrictions, and citizens are free to move inside the country. The overall demand has recovered or even surpassed the time before the beginning of the pandemic. However, the supply side is trailing. Gaming consoles, cars, and everything that requires computer chips cannot be manufactured as there are none. Sam Shead (2021) interviewed Glenn O'Donnell in his news article, and O'Donnell explains that demand for computer chips has recently risen so dramatically that it might take until 2023 that the supply will match it again.

2. Country B is an emerging economy. The trailing supply of high-class products does not affect the country, like the advanced economy. The number of its COVID-19 cases is relatively low, and the country aims to improve its infrastructure. However, as Lambert (2021) writes, the pandemic has surged the prices of lumber, and steel has a similar trend. The rise happened because the manufacturers were unprepared for the sudden rise of demand, which happened quickly after the pandemic. In this example, the supply is there, but as the country is relatively poor, the world market price exceeds its capability to create demand.
3. Country C is an advanced economy where the number of cases has been high for a long time. The daily numbers are still surging as the delta variant is spreading among the citizens. Due to this, the country has severe restrictions, which have led to businesses being closed. Thus, some of the employees have either been fired or laid off. As the uncertainty is high, people are mostly spending on essential products. It leads to a significant negative demand shock of services. It will only be fixed after the vaccines start to build herd immunity or the number of cases decreases otherwise.

As the economic downturn was unforeseeable and the economic shocks differ between countries, there is a need for global actions. Because even if different countries battle with different shocks, it is important to understand what is happening and where. The G20 countries agreed to apply a wide range of policies and to support the widespread

use of macroprudential and other instruments to maintain financial stability. Here are a few main points on how the Financial Security Board (2020a) considers the crisis should be tackled:

1. By continuous and reliable data collection to tackle the fluctuating environment.
2. Use of stress tests and modelling scenarios to study how the banking system's resilience may be affected by the uncertainty.
3. *"A forward-looking supervisory approach in light of likely changing circumstances."*
4. Communication between countries and agents about the utilization of policy instruments and supervisory results.
5. Global cooperation in maintaining international standards while using national regulation. (FSB 2020a)

From the points, it is possible to see how the current paradigm has shifted from microprudential to a macroprudential view. The discussion is that the resilience of banks needs to be viewed on a system level. Thus, G20 countries decided to start relieving the systemic risk and not only ensure that individual banks remain solvent. Now the shocks that the pandemic has inflicted have been discussed. Next, it is time to look at the statistics of their effects.

3.1.2 Loss of welfare

As we take a closer look at how the gross domestic product has evolved during the pandemic, it is easy to understand why groups like European Union and G20 nations have followed the situation closely. GDP, which is considered the measurement for welfare, fell sharply during 2020. The seasonally adjusted data that compares to the same quarter of the previous year from OEDC (2021) countries reveal that the 1st quarter was already negative for half of the nations, even if it was not until late February that the pandemic hit the economy. The second quarter was the worst of them all as the uncertainty due to the pandemic was at a very high level. Figure 7 illustrates this as Latvia, the United

States of America, and the United Kingdom all experienced a severe downfall. China is included in the graph as it was the only country followed by the OECD with a positive 2nd quarter. However, that illustrates more about how the economy works in China. The government has such a significant role in it, and they can adjust the level of output. On average, the OECD witnessed nearly an 11% decrease in GDP. During the second quarter, India lost nearly a quarter with a 24,09% loss.

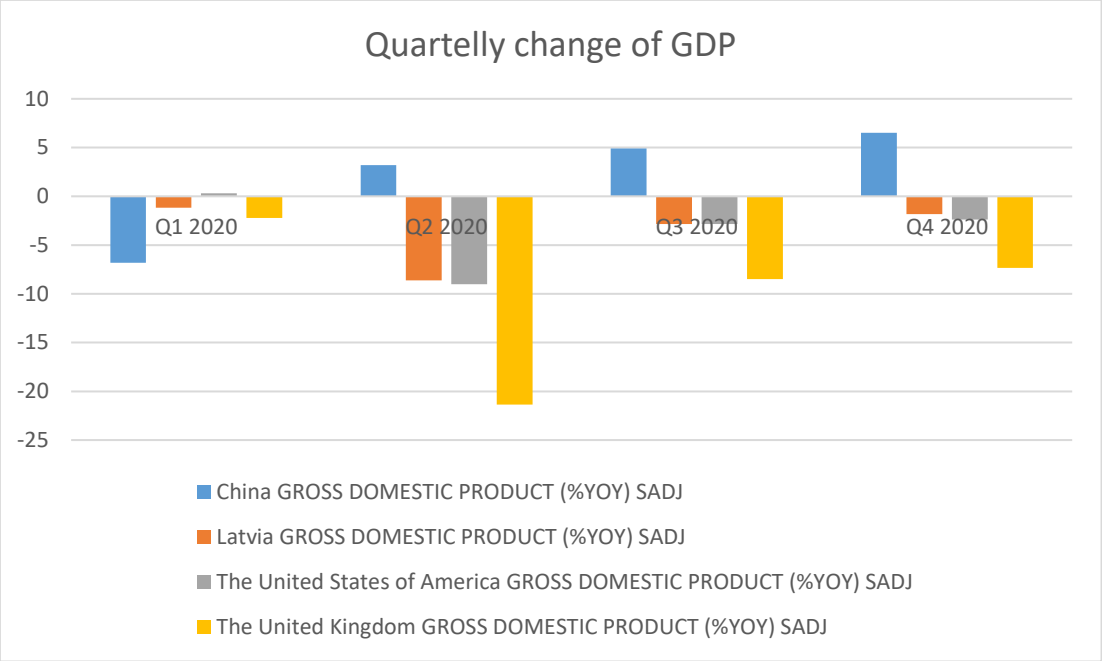

Figure 7 Seasonally adjusted quarterly GDP data of China, Latvia, the United States of America and the United Kingdom (OECD, 2021.)

The negative trend on gross domestic product continued in the third and fourth quarters when the numbers are compared to the GDP of 2019. However, the loss is not nearly as significant as during the second quarter. The average losses in the third quarter were 3,7% and the fourth quarter 2,7%. Even if the economy has started recovering, it will take a while until it reaches the same welfare level as before the pandemic. OECD (2021) predicts that the world's GDP will return to the level prior to the pandemic in the first half of 2021. It means that at least one and a half years of growth is lost. Furthermore, as the

pandemic is ever-evolving and the delta variant is currently spreading, predicting the future growth of GDP is yet challenging.

Also, what is important to remember is that the recovery speed will vary significantly between countries. Even if the global GDP starts to rise, there will be multiple countries still suffering greatly. Nations dependent on the traveling industry have suffered the most, according to the Financial Stability Board (2020c). Due to restrictions and general caution of people, they have not been flying or taking cruises into tourist destinations, causing a significant negative demand shock. To ease up the work- and leisure-related movement inside Europe, the European Commission (2021) established the 1st of July a Digital COVID certificate. The certificate comprises information on if a person is vaccinated, has a negative test, or has recovered from Coronavirus and thus permits them to move around Europe without any country-related restrictions or quarantines. However, the certificate has not yet provided a significant improvement to traveling. Finnair (2021) published their midyear report on July 15th, stating that their cash flow will turn positive earliest late 2021. As the flights are often paid prior, the industry expects that the flying will not take off for another few months. Thus, it is a negative indicator for countries that rely on tourism. On the other hand, the pandemic may also work as a wake-up call for multiple countries to broaden their source of income.

As the uncertainty on Q1 and Q2 was on such a high level, and the gross domestic product decreased globally, governments applied masses of supporting measures. Figure 8 by the Financial Stability Board divides the measures into categories. It shows how much of them have increased since the beginning of the pandemic. The graph illustrates, after WHO (2020) declared the pandemic on the 11th of March, G20 countries have applied over a thousand measurements. As we can see, most of the actions were taken at the end of the first and early second quarter, which aimed to stabilize the current situation. However, not all the instruments used were macroprudential, even though many of them were used. For example, several European countries reduced their cyclical counter

buffer or withdrew its designated rise, according to European Central Bank (2021b). Additionally, ECB state countries like Finland and Netherlands reduced or removed systemic risk buffers. Also, the Other Systemically Important Institutions increased their resilience so the crisis would not spread to the real economy. Next, the thesis aims to forecast what are the possible ways the economic recovery will continue.

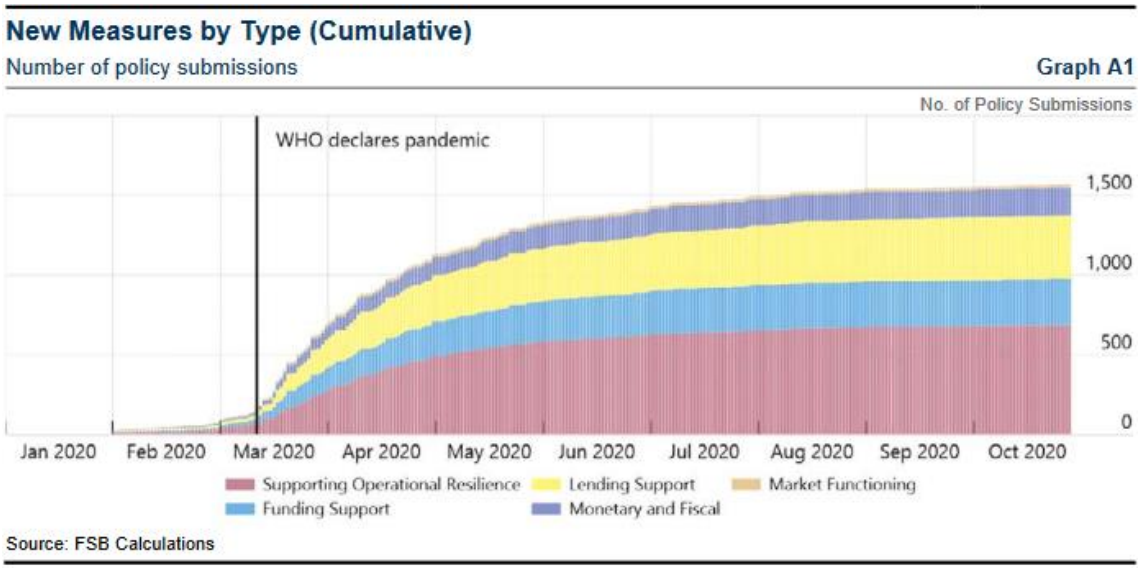

Figure 8 Economic measurements by G20 countries after the pandemic started (Financial Stability Board, 2020a.)

3.1.3 Financial recovery from the recession

This chapter discusses the financial recovery from the pandemic. There are different recovery shapes that describe how the economy can restore from the crisis. According to Sharma, Bouchaud, Gualdi, Tarzia and Zamponi (2021), there are at least V-, W-, U-, L- and K-shape which are all involved in the current discussion. However, the K-shape recovery is presented as the most probable option. It illustrates an unbalanced situation where some parts of the economy bounce back well where others stagnate or go into recession. Dalton, Groen, Loewenstein, Piccone and Polivka (2021) present excellent examples of these issues by comparing service providers such as barbers and restaurants to big tech companies. For the former, it is still impossible to determine whether the

business will ever return to normal. However, the latter has been able to thrive even during the pandemic, and the technological progress will only enhance their position.

Thus, this reflects also in a more humane level. The study by Dalton et al. (2021) shows how the pandemic affects people with different socio-economic statuses. Overall, the lowest earners have suffered the most. The study concludes that in every industry in the US, the lowest-paid workers have lost their vacancies relatively more than high-paid workers. Also, the high-paid workers have re-employed quicker once the situation has gotten better. The data of the study reveals that high-paid workers are more likely to be paid even if they are not able to work under the circumstances. Additionally, employers rarely cover the costs of health insurance for lower-income classes. Due to these reasons, the K-shape recovery takes place in the US at a lower income level. Workers of some industries may even face L-shaped recovery where the significant loss occurs, but the surge back to the prior level never happens. The recovery will be V-shaped for the high-income workforce, and their income returns quicker to previous levels.

When looking at previous financial troubles Eichengreen, Park and Shin (2021) conclude that double shock crises are often lengthier than single shock. The corona pandemic is one as it has produced both supply and demand shocks. However, the researchers discuss that the current situation is not even a financial crisis. Writers think that the comprehensive appliance of macroprudential and microprudential instruments has enabled the economy to restart again. However, they underline that the pandemic will still cause more financial issues in the future. Some operators may survive the initial crisis, but due to the company's worsened economic state or transformed consumers' demand, they will default later. The IMF (2021) data also displays that many governments have applied mandatory periods when loaners pay only the loan's interest, or no bankruptcies could be filed until a specific date. Depending on how well the economy has bounced back from the dip, these might work as stabilizing measurements as the companies have more time to rebalance their finances. However, these measurements can lead to a more

extensive bankruptcy in the future as companies that would fail even without the financial stress of pandemic will now keep operating.

Inflation is an issue that supervisors need to follow in the future. It can have a significant impact on how a country will recover. As there were shutdowns or strict restrictions globally for a long time, people could not consume similarly. Now, as the restrictions have eased and the uncertainty caused by the pandemic decreases, consumption has taken off. Thus, the US consumer price index (CPI) was up 5,4% in June 2021 compared to the previous year, according to the US Bureau of Labour Statistics (2021). Especially steep the rise has been on gasoline prices but also eating out, and other services have become more expensive. As the US is aiming for an inflation level of just below two percentage, it is safe to say the current state is above that. Eichengreen et al. (2021) discuss the situation in their study and how it is troublesome. As inflation rises, governments use the interest rate to stabilize the situation. However, as the economy is currently recovering from financial unrest, the article says that raising the interest rate would be controversial. Usually, the restrictions in monetary policy are applied later in the economic cycle, during a boom phase. Also, if the central banks think that inflation is only a short-term threat, it could be that no measurements will be taken to balance it.

As we have now discussed the consequences of the pandemic on the global economy, it is time to take a comprehensive look at how macroprudential supervision works. As the current situation is so peculiar, the indicators could not predict the current state of the economy as they all followed changes in financial markets. However, as extreme weather and pandemics will become more common due to global warming, it is essential to discuss should non-economic indicators be established. Also, many economic indicators have been warning about possible distress before the pandemic. Therefore, these indicators can affect how the situation will turn out in the long run.

3.2 Indicators

The idea of indicators is to distinguish the accumulation of systemic risk before it materializes. In their report, Constâncio et al. (2019) discuss that trust towards indicators on predicting economic unrest has risen since more and more economists have abandoned the mindset of efficient market hypothesis. The new way of thinking leaves room to start analysing previous distresses to learn repeatable patterns. The economists have found out that the patterns can be used in forecasting the economy. Taipalus (2019) states in her presentation that evolving booms should be detected 1-3 years beforehand to give regulators time to react conveniently to prevent the risk from materializing.

To spot economic unrest, there is a massive selection of indicators supervisors can follow. In their report, European Systemic Risk Board (2021b) divide the indicators into seven groups. Macroeconomic indicators follow values such as the Unemployment rate, the growth of GDP, and government debt-to-GDP ratio. Credit indicators follow the growth of indebtedness of households and how the price of loans has developed. Funding and liquidity indicators study how the balance sheet of the banks construct. They try to see if institutions have significant maturity transformation and what is the loan-to-deposit ratio. The fourth group includes market risk indicators. They illustrate the volatility of different assets and currencies while also looking at short-term and long-term interest rates. The profitability and solvency measurements represent the fifth category. It examines the yields of lending and the overall operations of banks and insurance companies. Some indicators measure the amount of non-performing loans and risk weights of institutions' current assets. Sixth indicator category deals with structural risk. It includes illustrations of the size of countries' banking sector, how the sector is leveraged, and a comparison of which countries have the most assets in the non-banking financial sector. The last category includes indicators that illustrate the interconnectedness of the sector. Its indicators explain how assets connect institutions and how much liquidity they have compared to other institutions.

However, there needs to be also a way to supervise the indicators. According to Krishnamurti and Lee (2014), the authority in charge of the country's macroprudential policy needs to have an early warning system to spot macroprudential threats. They present in writing the model illustrated in figure 9. The model is presented as a circle because the supervisory work is continuous. Additionally, each risk has its own circle as they may evolve separately.

1. Monitor: Continuous observing needs to be done to distinguish the current situation. It is essential to collect information extensively as sometimes the risk may develop in a less regulated sector as the non-bank financial sector.
2. Analyze: It is important to go through the changes that have occurred and see if there are some alerting signals in the data.
3. Interpret: If the data includes distinct signals, it is crucial to comprehensively gather more information to view possible risks.
4. Assess: Estimate how well the system will endure if the risk materializes.
5. Identify: Recognize if a macroprudential response is necessary.
6. Communicate: Inform regulators about the prevailing risk to institute a process to solve it.

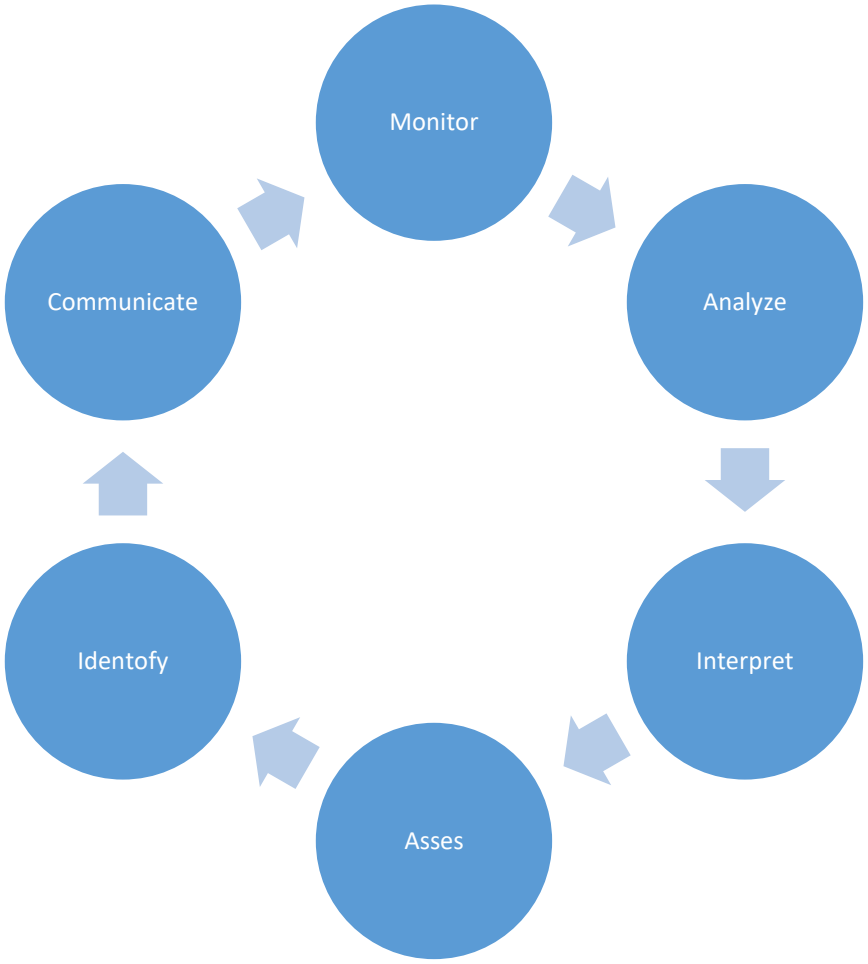

Figure 9 The function of early warning system (Krishnamurti & Lee, 2014.)

Now it is time to take a closer look at how the process of choosing indicators to follow takes place. In their research, Virtanen, Tölö, Virén and Taipalus (2017) apply the unit root test to study which indicators are the most efficient in signaling the upcoming bubble. They apply two different systems RADF and SADF, where RADF estimates possible future outcomes and SADF estimates how the estimates would have performed in data that has already occurred. According to the study, the best indicators are household credit-to-GDP ratio, loans to income ratio, and residential real estate price-to-income ratio. All the signals alerted more than four years before the bubble bursts. There were also other good indicators which most included the price of housing in one way or

another. Additionally, the study shows that applying stock prices as indicators is inefficient as they alerted only six quarters before the turmoil.

However, the problem with the indicators is not only to get the signal that alerts from possible bubbles but also to have a truthful signal. The information of the signal is always one out of three types. It is either correct, has a type I error, or type II error. According to Virtanen et al. (2017), the false positive, type I error, means that the indicator signals falsely, and no crisis will occur. Type II error is the opposite, as in that case, the build-up of systemic risk in the financial sector will go unnoticed. After researching data from 15 EU countries from 1980 to 2012, Virtanen et al. (2017) show that false signaling is a major issue, and thus, it is essential to keep improving the indicators. The occurrence of false-positive signals is far more common than false-negative. For example, the loans to income ratio, one of the most prominent indicators by its predictable qualities, will dismiss every tenth turmoil.

Additionally, more than thirty percent of the alarms are incorrect. In their study, Virtanen et al. (2017) also had a usefulness test that combined the early signaling with the indicator's accuracy. The combination of credit-to-GDP and debt servicing ratio came out as best, but also indicators that include residential and share prices were found valid. The following year Virtanen, Tölö, Virén and Taipalus (2018) took a slightly different point of view as they compared the unit root method to other methods. The method proved to be efficient, and the same indicators, credit-to-GDP ratio/debt service ratios and residential price-to-income ratio, appeared efficient as in the previous study. Nonetheless, there is another way to improve the accuracy of the indicators than by improving individual signals. Virtanen et al. (2017) conclude that by combining the signals, more precise results are gathered. Their study finds that a combination of credit-to-GDP and debt servicing cost with the addition of residential prices or stock prices signals is the most accurate predictor.

An example of how indicator reporting is conducted can be found in appendix 2. Established by European Central Bank, it illustrates the probability of how likely a financial crisis would occur in five to twelve quarters after a signal is noticed. In this report, the issues are embedded in structural systemic risk as to the overvaluation and price-to-income ratio. The signals concerning the cyclical systemic warn about the growth rate of residential prices even if they are on a stable level with few exceptions (Constâncio et al., 2019.)

Another great example of macroprudential indicators can be found in a biannually released report by the Bank of Finland (2020). The *"Makrovakausraportti"* scrutinizes the current situation of the country from the macroprudential point of view. It also illustrates the change on multiple indicators like the growth of residential loans and the indebtedness of households. However, the most illustrative figure of them all is as an appendix 1. It summarizes multiple structural and cyclical indicators, and by color, visualizes the level of systemic risk each indicator illustrates. Currently, it seems like structural issues are causing troubles for Finnish supervisors as nearly all of them, especially the ones dealing with the indebtedness of households, have been red for over a decade. However, this can also be due to the loose monetary policy that the European Central Bank has practiced since the Financial Crisis of 07-09. Households' interest expenses compared to income indicator supports the reasoning. Even if the debt has risen, the expenses have not risen alike. The status may change if the interest rates start to rise due to inflationary pressure escalated by the COVID-19.

Goodhart (2020) discusses the rapid growth of broad money and the surge of savings in his article. After Coronavirus hit, the people have not been able to spend the same way as before the pandemic. After the society opens again, it can increase inflation as the money directs to consumption. Thus, leading to increasing interest rates as governments try to maintain price stability. On the other hand, Goodhart (2020) finds equally evidence why inflation will remain low. It may take a long time before the consumers will start to spend after the crisis. The lag is due to the high uncertainty as it is impossible to predict

how the pandemic will evolve. As the spending will not increase in that case, the inflationary pressure will remain modest or non-existential. However, the supervisors need to keep their eyes on this as it can be a big materializing event of systemic risk.

There are also studies that indicators work on the forecasting process even if there are some issues. For example, Phillips, Shi and Yu (2015) studies different methods of analyzing the price-to-dividend ratio of SP500 from January 1871 to December 2010. They conclude that the indicator was efficient in distinguishing a bubble. However, if there were more than one bubble in a single interval, the indicators did not perceive the latter. Therefore, it is always good to use multiple indicators as the other one can detect what one misses. Using multiple is also something that Virtanen et al. (2018) conclude should be studied more to understand better which indicators work well together. After studying the indicators, it is logical to move on to macroprudential instruments to see how governments can react to the threat of systemic risk.

3.3 Macroprudential instruments

Just as with the early warning system, the appliance of macroprudential instruments follows a cyclical manner. First step is to identify the risk, evaluate it, and fully understand how it might affect the financial system. Then a suitable instrument is decided to tackle the adverse effects of the shock. However, before the instrument is applied, some more work needs to be done. As the global economy is a vast entity, the decision is run through a few scenarios. This way, the negative spillovers can be reduced to a minimum, and regulators can ensure that the instrument works as expected. During the implementation, the regulator must communicate distinctly. As mentioned in chapter 2.4, communication has a significant role in how well the macroprudential instrument works. After the implementation of the instrument begins the evaluation phase. Even with proper assessment and scenario work, the instrument may have a different impact as expected. An analytical phase starts the new implementation cycle as it may expose flaws in

previous regulation or unveil issues that went previously unnoticed (European systemic risk board, 2018.)

The variety of macroprudential instruments is wide and more instruments are progressively developed. However, as macroprudential regulation is still such a recent phenomenon, the grouping of instruments is still under debate. In a study by Ayyagari, Beck and Soledad Martinez Peria (2021), the instruments are classified by which shareholder it affects, such as the borrower in case of loan-to-value ratio. Another way to divide the measurements is by categorizing them by how they combat systemic risk. It is presented by the European Systemic Risk Board (2018), and it gives a good view of how different instruments affect multiple problems. For example, a systemic risk buffer can ease the concentration of exposures while helping simultaneously with the moral hazard dilemma. Although this framework builds a comprehensive picture of why macroprudential instruments are applied, this thesis will not use it. The framework is too broad as the thesis aims to investigate the current financial turmoil caused by COVID-19. The grouping applied in this paper is by Lim et al. (2011). It is initially presented in an IMF working paper. They divide the instruments into three categories: credit-, liquidity- and capital-related instruments depending on how they affect the economy. It is a straightforward classification which, however, gives a broad enough view on different instruments.

3.3.1 Credit-related instruments

Regulators use credit-related instruments to limit the amount of credit granted to borrowers at a given time. The regulation provides the supervisors to control the indebtedness of consumers as excessive indebtedness can be very harmful to the economy. Limits can be drawn for consumers but also for institutions. A few examples of such limits:

1. Loan-to-value ratio (LTV) is a cap that dictates how much one may have loans compared to the asset they are buying. It is used often in residential borrowing. For example, in Finland, the limit is 90% or 95% for first-time buyers meaning the

buyer needs ten or five percentage own assets, according to Finnish Financial Supervisory Authority (2020).

2. Another way to look at the subject is by debt-to-income ratio, sometimes referred to as debt-to-stable-income ratio. It reflects the consumer's relative indebtedness compared to their income. The figure is important as the indebtedness of consumers affects the growth potential of the domestic economy. The debt boosts the economic growth up to 70 percent, according to a report of the IMF (2017). However, levels higher than that will dampen the growth.
3. Limits on foreign currency lending are applied especially in emerging markets. High levels of such lending can cause significant troubles for consumers if the value of dollars shifts significantly. Similarly, the change means that the money required to repay the loan increases in a similar manner. A similar situation occurred in Finland during the 90's financial depression.

Governments mostly use the loan-to-value as a permanent value. However, Mendicino and Punzi (2014) find that the countercyclical LTV ratio is very efficient in stabilizing the economy and thus increasing welfare. They state that the most efficient way to make instruments countercyclical is to link the level to residential prices and interest rates. They conclude the result while using two-country dynamic stochastic general equilibrium. None of the two countries were real as Mendicino and Punzi generated one to mimic the U.S. economy and another to comply with the economy of the rest of the G7 countries.

The finding gives supervising organizations the possibility to take steps to automate the use of instruments. For example, for every 5% of the LTV, there is a threshold. If the indicator moves from an interval to another, the ratio updates automatically. Additionally, this would give more transparency to the appliance process. The creation of automated instruments would release more time for developing and testing new instruments. However, the automated instrument would need a regular calibration in case the overall economic environment shifts.

3.3.2 Liquidity-related instruments

As the credit-related instruments affect the demand side of the credit more generally, the liquidity-related instruments tackle the systemic risk from the supply point of view. The primary use of the measurements is to reduce mismatches that are taking place on loan markets. Here are three examples of liquidity-related instruments:

1. The first imbalance is the currency mismatch. It often takes place in emerging economies as it requires that the country has fixed exchange rates and underdeveloped domestic bond markets. As the bond markets are inchoate significant amounts of debt are issued in foreign currency. Thus, the assets on the balance sheet are in domestic currency, whereas the liabilities are in foreign. The greater the imbalance is, and the more volatile the currencies are, the bigger the currency mismatch is (Bussière, Fratzscher & Koeniger, 2004; Burger, Warnock & Cacdac Warnock, 2021).
2. Second liquidity-related issue is the maturity mismatch. In maturity imbalance, the assets are long-term, whereas the liabilities are short-term. In this case, the assets need to be financed multiple times during maturity, exposing them to changes in interest rate. Therefore, supervisors can enhance the banking sector's resilience by limiting the mismatch between assets and liabilities.
3. Liquidity coverage ratio ensures that banks have enough liquid assets to survive a possible 30-day financial stress. The assets need to be also high-class, which can be easily liquidated (Bank of International Settlements, 2013.)

In their report, Lim et al. (2011) discuss that reserve requirements could also be applied to enhance the liquidity in the financial sector. Reserve requirements define the mandatory portion that a bank needs to reserve from a deposit. However, reserve requirements are often considered as part of monetary policy. As more of the world's lending goes via non-financial banking institutions, according to Aldasoro et al. (2020), the less reserve requirements affect the global economy. Thus, reserve requirements are not included as a macroprudential instrument in this thesis.

3.3.3 Capital-related instruments

The final category of measurements affects the accumulation, distribution, and circulation of capital in the economy. As the liquidity-related instruments, capital measurements mainly affect the supply side but there are exceptions to be found in following examples:

1. The countercyclical buffers are built to have resilience if the systemic risk materializes. If havoc spreads in financial markets, the buffers may be released, so the effect of turbulence on the real economy is minimized. According to the IMF (2021) data, releasing them was one of the most widely used instruments during the corona crisis. It might be because of the lockdowns that took place. As the uncertainty was high, central banks wanted to ensure that otherwise sound companies would not run out of capital.
2. Another efficient capital instrument is dynamic loan-loss provisioning. According to IMF (2021), in multiple countries, regulators did not implement planned provisions on non-performing-loans during the corona crisis. So, the individuals and companies would have time to balance their status, and banks would not need to take premature actions. Closely related to this instrument is the moratorium from one month to more than a year implemented in more than half of the countries studied. The act gave everyone more time to adapt to the economic state caused by the pandemic.
3. One widely used capital-related instrument during the pandemic is the restriction on paying dividends. The restrictions were given to banks worldwide. For example, European Central Bank decided that banks should not carry out any share buybacks or pay any dividends on behalf of its members. This way, all earnings and assets were dedicated to maintaining its primary operations (IMF 2021.)

More instruments belonging to different categories can be found in appendix 3. It is a list of all the macroprudential instruments from the IMF (2021) summary that could be categorized. However, they were not all presented in this chapter as sometimes only the

object decides if the instrument is macroprudential. However, this chapter aimed to establish base points on understanding different instruments. The next chapter will take a closer look at how macroprudential instruments were used in the past. It will also discuss, how they have affected the economy.

3.4 The previous use and effectiveness of macroprudential instruments

Two things are notable when going through how the macroprudential instruments have been used in the past. Firstly, there are findings on how the emerging economies and advanced economies apply the instruments very differently. Secondly, there is evidence on how well the macroprudential instruments build resilience on to the economy. However, there is only a little evidence on how well they balance the economy after the crisis. The lack of research is critical if thinking about the recovery of the current pandemic. However, the scarcity of studies is not a surprise as there has not been a global financial crisis after the re-merge of the measurements. This chapter will discuss these three subjects in this order.

After studying how different economies use macroprudential instruments, it is safe to say that emerging economies use them more actively than advanced economies. In their research, Akinci and Olmstrad-Rumsey (2017) study 57 countries from which 23 are advanced, and the rest are emerging economies. They find that emerging economies use the macroprudential instruments more comprehensively. The advanced economies use them only to balance the residential sector. Cerutti, Claessens and Laeven (2015) found similar things while studying 119 countries from 2000-2013. They conclude that advanced economies use mostly just borrower-based instruments to soothe the residential markets, such as adjusting the loan-to-value level. It is nothing compared to emerging economies that use a wide range of macroprudential instruments. Kenya and Cambodia are good examples of that as they both have dynamic loan-loss provisions. It means that the measurement adjusts to the current state of the economic cycle. Also, the study finds that emerging economies use more often instruments to regulate the lending in foreign

currency. Foreign currency loans are often utilized if the domestic markets are underdeveloped. Even if the loans increase the lending, it also increases the systemic risk of local markets. If the foreign currency position strengthens compared to the domestic one, the value of the loan position increases, and borrowers can become insolvent. This type of incident can lead to economic unrest that shakes the real economy.

The study of Akinci and Olmstead-Rumsey (2017) also holds another significant finding. Although the Great Recession was the beginning of a new dawn for macroprudential instruments in advanced economies, emerging economies have been using them actively before. It can be because where advanced economies have considered that their economies are stable, the emerging economies are often more volatile. Thus, in emerging economies, macroprudential instruments were seen as a practical way to build more economic resilience.

It is good still to pay another thought on why advanced economies use the measurements only to adjust the residential markets. A reason for that can be a finding of IMF (2017). They conclude that residential debt bubbles are the most harmful to the real economy. Their effect on GDP and consumption is more significant than stock market crashes. Due to this, the decision-making maybe has shifted towards housing markets and their leverage. However, Cerutti et al. (2017) also point out that the advanced economies have also started to use macroprudential instruments more comprehensively in recent years. Countercyclical buffers, dynamic risk weights, and many others have been added to their instrument list, but they are still nowhere close to emerging markets.

Now it is time to take a closer look at how the macroprudential instruments have affected the market. Akinci and Olmstead-Rumsey (2017) also study how the measurements affect the overall bank credit, housing loans, and residential prices. They compared countries that have applied macroprudential instruments to ones that had not. Graph 10 illustrates the results. In all variables, the countries which have taken macroprudential measurements, the growth has dampened. The finding is very promising as,

according to the researchers, nearly all the instruments used were restricting. This way, the measurements have been able to adjust the growth on leveraging.

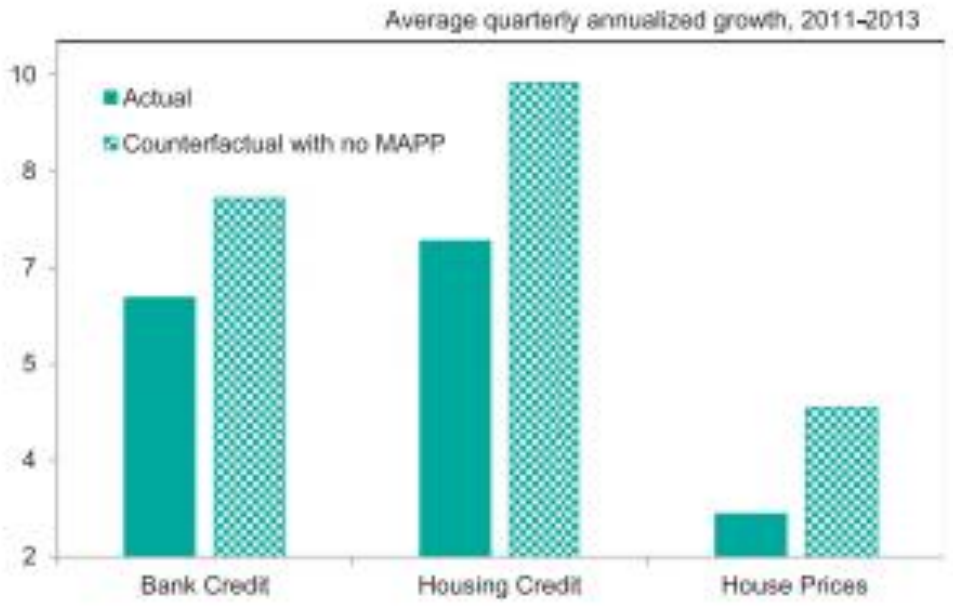

Figure 10 Effects of macroprudential instruments (Akinci & Olmstead-Rumsay, 2017.)

The International Monetary Fund (2017) did a similar finding in their "Global Finance Stability Report." In it, they present the relation between the household credit growth and utilization of macroprudential instruments. What they find is that restricting macroprudential instruments does dampen household indebtedness. They also conclude that it also works the other way around. When the economy is in a downturn, easing measurements helps to start the economic recovery. The finding is critical from the point of view of this thesis. However, Cerutti et al. (2015) conclude that the policy measurements work better during the boom phase than the bust phase. It can lead to a more substantial welfare loss as the longer it takes the economy to recover, more people are affected by the turmoil. Thus, more precise optimization should be done to minimize the effect on the real economy.

Moreover, the optimization needs to happen at a more global level. Cerutti et al. (2015) find that the use of macroprudential policies increases cross-border borrowing. The

surge is especially significant in open economies where the capital flow is not restricted. The surge can have a positive outcome if the regulation is coordinated correctly. However, if the discussion concerning the measurements is insufficient, the effect of the instrument will be harmful or non-existent. In case of excessive leverage, the growth of lending will continue if neighbouring countries do not match the restrictive measurements. However, an individual country can affect how often financial distress occurs in their country. Gertler et al. (2020) state that the use of countercyclical buffer can help with the issue. Their study concludes that financial difficulties will occur more rarely if the instrument is in use. It will dampen the growth of leverage before it booms.

Lastly, Cerutti et al. (2015) discuss why the macroprudential policies have a more significant impact on reducing excessive leveraging in emerging economies than in advanced economies. It is possible that as they use them more extensively, the policies have a more substantial overall impact on the economy. Also, as the use of measurements is more comprehensive, it can be easier to detect the effects by macroprudential instruments compared to other financial policies, such as monetary policies. One reason could also be that as emerging economies utilize macroprudential instruments more, there is a broader range of accurate information. This needs to be investigated more in the future so the difference in effects would not be so significant.

As stated at the beginning of this chapter, the effectiveness of macroprudential instruments helping to recover from financial distress is studied very little. This thesis aims to understand better if macroprudential instruments are also vital in the revitalization of the economy during turmoil. As with current findings, the instruments seem more like adjusting measurements utilized before the turmoil. The result is important because if there is no evidence that macroprudential instruments are sufficient in re-stabilizing the economy, the focus should be shifted to somewhere else for now. Only after the economy is back in the recovery phase should the focus return to macroprudential instruments as evidence proves they enhance the resilience during the boom phase. The next

chapter will explain more carefully what the premise is on researching the mentioned problem. In addition, it aims to explain how and why the thesis is built as it is.

4 Methodology and data of the thesis

This chapter explains the data and method of this thesis. First is the methodology. It illustrates how this thesis will answer the research questions. Then the paper discusses more the data. The database of macroprudential instruments used in the paper is explained thoroughly. It was built from data from the International Monetary Fund using the accumulated knowledge from theoretical chapters. This chapter aims to prepare the reader for the empirical part in chapter five.

4.1 Methodology

To understand more comprehensively how the research questions of this thesis are studied, the "research onion", developed by Saunders, Lewis, and Thornhill (2009), is used. It is a six-layer method that visualizes a person's possibilities while choosing their method and data in a study. According to Saunders et al. (2009), the outermost layer represents the researcher's philosophical view. In this thesis, the macroprudential instruments and gross domestic product are the observable instruments. The change of gross domestic product is easy to measure as it is a globally standardized figure but measuring macroprudential instruments is more complicated. It is possible to calculate the number of macroprudential measurements, but the exact effect of the instruments is nearly impossible to calculate. It is because they can start altering the behaviour of institutions or consumers even before their appliance. Moreover, they are often announced months before the appliance, so the prior effects take place over a long time. Also, the usage of other economic measures such as monetary policy actions makes it hard to detect the effect of macroprudential policies. However, the most convenient way to measure the effect was to study the activity and how often nations worldwide use them. The research questions are trying to find a law-like pattern between the appliance of the measurements and the development of GDP, such as more active countries lose less welfare during economic turmoil.

The approach is the next layer of the "onion". In this study, the approach is deductive. After reading previous studies discussing macroprudential instruments and their previous effects on the economy, the research questions were composed. The idea is to see if the effects would be similar in such a peculiar shock as the current pandemic.

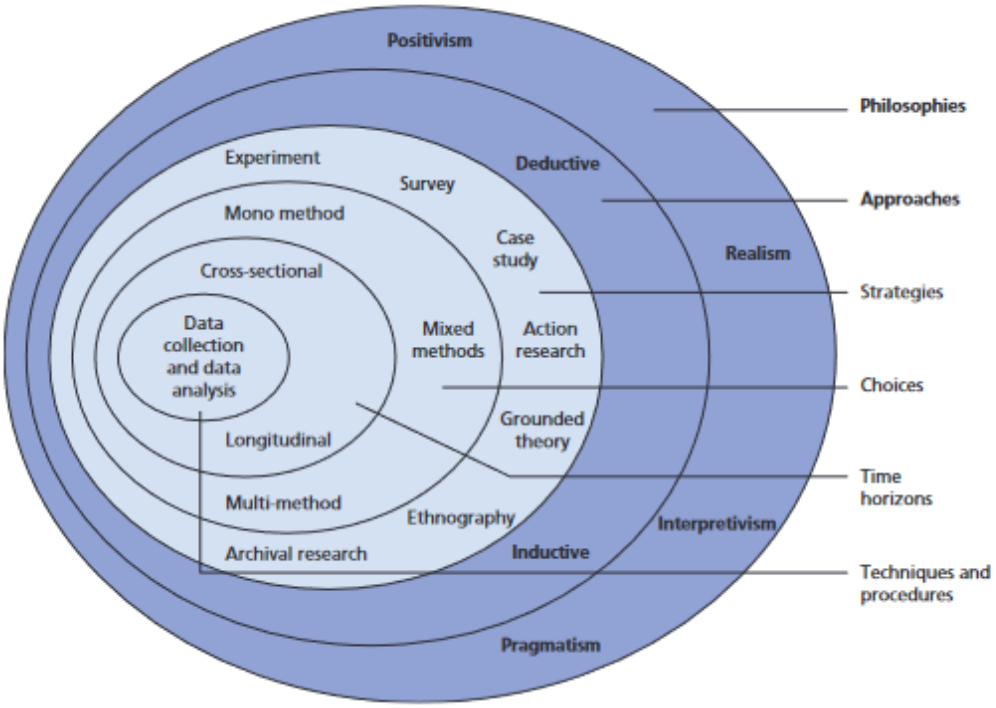

Figure 11 The "research onion" by Saunders et al. (2009.)

In their book, Saunders et al. (2009) discuss many ways to conduct the research. Depending on the study, one or multiple methods can be used simultaneously. Using more methods allows discussing the research questions more broadly. This thesis utilizes the mono method approach being archival research that uses quantitative data. The gross domestic product numbers are collected from the databases of the World Bank and the OECD. The macroprudential measurements that the countries have taken are a combination of archives of the International Monetary Fund, the European Systemic Risk Board, and the European Central Bank. All except the European Central Bank are secondary sources as the decision-making takes place at a domestic level. Saunders et al. (2009) emphasize the importance of evaluating the validity of secondary sources. It means

thinking if the data is collected initially to measure different purposes than in this study. The GDP is a widely used measurement of welfare, and that is what it also measures in this study. However, there are multiple reasons why it is an inefficient indicator. Those reasons are presented in chapter 4.2, which discusses the most inner ring of the “onion”, data and its analysis. Nevertheless, other researchers studying macroprudential measurements have used it as an indicator, so it will be used in this thesis. Also, counting the number of instruments during the pandemic illustrates well the activity of countries.

The last layer before the data discusses the time horizon. Saunders et al. (2009) present two ways to perform the study. One can do it as a cross-sectional study that measures the event at a specific point in time. Another option is a longitudinal study that follows the phenomenon’s evolution over time. Following the growth of GDP over a decade is a great example. The former is applied in this thesis. It studies the macroprudential activity, over the year, at the end of 2020. A longitudinal study would have also served well in conducting the research. It would have enabled to see if the activity would have affected the GDP in a quarterly manner and not only annual. However, as the exact dates of some macroprudential measures were missing, it would have lowered the reliability of the data. Thus, it would have also affected the reliability of the results. Next, the data, which is the innermost layer of the model, is taken into discussion. Chapter 4.2 presents how it is collected and analyzed. There will be an analysis of decisions and definitions that were made while collecting the data. Also, the information includes some issues that hinder the validity and reliability of the data. The chapter provides a better understanding of the flaws and how they can affect the results.

4.2 Data

The last layer of the "onion" concerns data that comes from many different sources in the thesis. The first data source used is the annual gross domestic products of OECD countries and other countries whose data OECD gathers. The countries were chosen for this study as the OECD had quarterly GDP available when the study was initially

supposed to be longitudinal. However, as the accuracy of the macroprudential instrument forced to change the study over to a cross-sectional study, the annual GDP and GDP per capita figures are gathered from the World Bank DataBank (2021a; 2021b). The gross domestic product illustrates the value created by producing goods or services in a country, and the annual change compares it to the current year to the previous year. OECD (2021) states that it is the most important economic indicator used globally. It provides a standardized way to compare the development of economic welfare, such as 47 countries in this thesis. The country list of OECD and other followed countries is comprehensive as it consists of both advanced economies and emerging economies, which allows testing the previous findings of academic literature. Because as has been mentioned earlier, advanced and emerging economies have utilized macroprudential instruments differently in the past.

The thesis separates the countries the same way as the International Monetary Fund does in their World Economic Outlook (2021). The OECD (2021) database includes the gross domestic product of 30 advanced economies and 17 emerging and developing economies presented in appendix 4, and their population is collected from Worldometer (2021). The data includes the GDP of 2019 and 2020. It gives a good comparison as the former was still a usual year, while the pandemic took off during the latter. One thing that is good to remember when observing the GDP data is that all the changes during 2020 are not due to COVID-19. Some economies have been struggling even before the pandemic, and so the shocks affect them very differently. However, the aim is to see if there are changes in the big picture and whether the use of macroprudential instruments can explain them.

The use of the gross domestic product can be criticized as it has significant shortfalls in measuring people's welfare. Bergh (2009) examines the flaws in his study. First, he notes that GDP does not include informal economy, for example, household- or voluntary work. Thus, much welfare is not measured. Also, he states that it neglects the externalities of the actions increasing the GDP. The use of fossil fuel is an example of this as it

accumulates the GDP, but the global warming caused by it has not been taken into account. Also, fishing is a major industry in many countries, but some areas are overfished, which leads to biodiversity loss. Finally, Bergh (2009) points out that as the income distribution is unequal, the marginal utility of welfare differs in different levels of income. The criticism is fair, and there is no doubt that the GDP has these and other shortfalls. However, GDP provides a good indicator of how welfare has developed in the country. Moreover, being a standardized measure calculated throughout the world, it enables the thesis to examine the impact of the pandemic on welfare.

The second source for data is a macroprudential policy tracker maintained by the International Monetary Fund (2021). The overview contains information of 197 countries globally and union-level decision-making, such as how the EU has reacted to the current circumstances. However, the data includes more than just the macroprudential measurements. The data introduces how the COVID-19 has spread, the nation's current situation, explains the fiscal policies that have been applied, presents the monetary and macroprudential policies applied during the pandemic, and finally discusses if the country has taken measurements concerning the exchange rate or domestic liquidity. As the information of the IMF is in a written form, manual labour was required on constructing a database to be used in the empirical part.

There were multiple restrictions and other things that needed to be taken into consideration while constructing the database. As mentioned in previous chapters, the definition of a macroprudential instrument depends more on how or who applies the measurement than what is the actual instrument. For example, if a Loan-to-Value ratio is applied for a single institution without a significant effect on the domestic banking system, it is microprudential policy. However, if a domestic regulator implements a distinct level for all the counties' banks, it is a macroprudential policy used to build resilience in the banking system. Additionally, in the theoretical part, the categories of the instruments were discussed. In the database, the instruments divide into credit-, liquidity- and capital-

related instruments. Appendix 3 is a table of all the instruments that studied countries implemented.

To validate the data of IMF, a press release by the European Central Bank (2020a) was used to add suspending dividends as an applied instrument to some countries. It was because not all the countries under the rule of ECB had mentioned it in the IMF summary. Also, some of the European nations had not mentioned changes on the countercyclical capital buffer, and those changes were updated using the data of the European Systemic Risk Board (2021a). These issues reveal a flaw in the used data. As the data is not filled similarly between countries in the IMF summary, some actions can be missing, reducing the data's validity. However, as there are currently no databases containing the information needed, the summary was the best available source. Studying the implemented instruments of every country one by one would have been an option. However, as this is a Master's thesis, the method would have been overly time-consuming.

As mentioned, the definition of the macroprudential instruments was that each of them needs to be distinctly either credit-, liquidity- or capital-related. If it could not be conveniently judged as being part of one, but it still has a significant effect on the stability of the real economy, the measurement was collected on another spreadsheet. This spreadsheet is also discussed in the empirical analysis, even if they are not part of the quantitative study. A nationwide moratorium, used in many countries, is a great example of such. Many countries linked the measurement with the frozen classification of loans to the pre-Covid level. Thus, it gives consumers a chance to balance their economic state after the initial shock. The possibility will dampen the negative effect on the real economy as an unstable economic state decreases consumption. Also, banks are not required to gather more assets as they would if the grade of their loan portfolio decreases. The easing enables them to concentrate on providing liquidity to the markets. As seen, the effect of the moratorium is such multisectoral measurement that it would be controversial to categorize it. Additionally, changes in reserve requirement are prohibited from the data even if it was used by multiple countries. Some macroprudential studies examine it

as part of macroprudential regulation. However, institutions such as the Bank of Finland (2021a) state it is part of monetary policy and thus constrained from the data.

Lastly, before the empirical part, it is necessary to talk about the validity and reliability of the data applied in the study. The Statistics Office of Finland (2021b) describes reliability as how conveniently the test can be replicated later using the same questions as indicators. For example, the interviewee would answer similarly to the same question if repeated later. This means that external variables such as weather or salary would not affect the opinion of the responder. According to the Statistics Office of Finland (2021a), the validity indicates how well the indicator measures the phenomenon under research, such as whether parents' education level affects the future education level of their children.

To summarize some previous findings concerning the data used, the World Bank is a reliable source even if it provides secondary data. On the other hand, the validity of utilizing the gross domestic product to measure welfare in the economy is widely questioned. However, as it is still the most widely used measurement to study it no exceptions are being made in this study.

Nevertheless, the most significant issues of reliability and validity of the data occur in the database built using the data of IMF, ESRB, and ECB. First is the reliability of the data. Even if all the institutions are trustworthy, especially the IMF's information is not documented alike by each country. Therefore, other sources were used to make sure that the sampling would include every decision made. However, it is impossible to guarantee that the database includes all used macroprudential instruments even after these additions. Another reliability issue is that building the database requires a significant amount of individual decision-making. Another person might have built the database differently if they have a different understanding of the subject. It is an issue, especially as the theoretical framework of instruments is continuously evolving. The same issue affects the validity of the data. People can understand differently what are and what are not

macroprudential instruments. Because of the flaw, it is fair to argue that the data is not entirely valid. The issue would only disappear after the theoretical framework becomes distinctly established and a database built by its rules. Until then, the IMF data is the most accurate and comprehensive summary concerning the political actions taken under COVID-19. It is far from perfect but credible enough to be utilized in the thesis.

5 Empirical analysis and discussion

This chapter includes three sub-chapters. The first chapter displays the descriptive statistics of variables in use to study the research questions. The summary includes measures such as mean but also the distribution of values. In the second chapter, the two research questions are empirically tested. After both tests, there is an individual explanation of the results. The third chapter contemplates the empirical results more thoroughly. Moreover, critical discussion of what could have been done differently occurs. The last sub-chapter also presents the other findings of IMF data that were not included in the quantitative study. It presents some of the measures and what kind of effects they might have on the real economy.

5.1 Descriptive statistics

Descriptive statistics are a convenient way to illustrate the data used at a general level. In this thesis, eight different variables are in use to study two different research questions. Four of the parameters concern the applied macroprudential instruments as credit-, liquidity- and capital-related instruments are all one variable, and the combination of them all is an individual one. Then four variables describe the countries that are studied. A dummy variable divides countries into European and non-European countries as 30 out of the 47 studied countries are European. The European countries are marked as ones and others as zero. There are also variables for country's logarithmic GDP per capita in 2020 and logarithmic population. The final country-related variable is the change of annual GDP from 2019 to 2020, which will be used later as a dependent variable.

The macroprudential activity consists of 121 observations from which 16 are credit-, 31 liquidity-, and 74 capital-related instruments. From all the capital-related measurements, 31 were suspensions of dividends as countries used it actively. The largest number of instruments used from the single category was three liquidity-related and 4 in credit-

related and capital-related instruments. In overall activity, there were three countries Argentina, Colombia, and Saudi-Arabia, that did not use a single macroprudential measurement. On the other end of the spectrum, the Czech Republic was the most active with seven applied instruments, followed by India that used six. However, the mean in all variables was below the mode, making the variable positively skewed. The skewness and kurtosis cause that none of them are normally distributed, outlining some of the empirical tests out of use.

Similar findings can be made from country-related variables as none of them distribute normally. However, the logarithmic population is close as it is just minorly positively skewed. With gross domestic product per capita, the skewness as well as kurtosis were more significant. The average GDP per capita before logarithmic transformation was $32245 for studied countries, with the maximum being Luxembourg's $115873 per person. Lastly, the average change in the gross domestic product for the 47 countries was -4,27% during the year 2020. The most substantial decrease was Spain's -10,8% whereas few countries such Ireland managed to increase their GDP by 3,40%. The two located in the same continent and both countries that suffered vastly during the Euro crisis reveal how peculiarly the adverse shocks have affected nations. The distribution of GDP is also quite close to normal, with a slight positive skewness and flatness. Table 2 illustrates all the studied descriptive statistics.

Table 2 Descriptive statistics of studied variables

	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Macroprudential activity of a country	0	7	2,57	1,584	,577	,347	,146	,681
Credit-related activity	0	4	,34	,788	2,924	,347	9,892	,681
Liquidity-related activity	0	3	,66	,891	1,320	,347	1,032	,681
Capital-related activity	0	4	1,57	,972	,374	,347	,257	,681
Regional dummy	0	1	,64	,486	-,595	,347	-1,721	,681
GDP	-10,80	3,40	-4,2746	3,23879	,189	,347	-,133	,681
Logarithmic population of countries	5,53	9,16	7,2739	,79789	,198	,347	,090	,681
Logarithmic GDP per capita in 2020	3,28	5,06	4,3610	,39433	-,540	,347	-,102	,681
Valid N (listwise)								

The number of studied countries N = 47

5.2 Testing the research questions

At the beginning of the thesis, two research questions were stated:

1. Have macroprudentially more active countries suffered less from a GDP point of view than nations that have used fewer instruments?
2. Has the appliance of a specific group of instruments led to better results than others? The three categories studied are credit-, liquidity- and capital-related instruments.

There is an individual multiple linear regression formulated using the SPSS to study both questions. An issue that would occur with one regression is that the overall macroprudential activity of a country is a combination of individual instrument categories. Thus, there is a correlation among the independent variables, which corrupts the results and needs to be avoided. Therefore, a similar correlation test will also be done while studying both questions individually. The multiple linear regression model was chosen in this thesis as it is an efficient way to discover dependency between variables. Furthermore, as stated before, the thesis aims to find dependency between dependent and independent

variables. For example, if a macroprudentially active country would have suffered less from a GDP point of view during the pandemic, both their activity and GDP are high and vice versa (Gustafsson, 2019.)

In a multiple regression model, there is one dependent variable and several independent values. The variables are to discover if the dependent variable has a linear dependency with one or more independent variables. In both following models, the annual change of GDP will be the dependent variable. Tables 4 and 6 illustrate the results of the empirical tests. In the tables, the most attention should be paid to two figures. First is the regression coefficient, which reveals if there is any linear dependency between the variables. The further the coefficient beta is from zero, the more significant dependency the studied variable has on the dependent variable. The second important figure shows if the findings are statistically significant which is stated below the coefficient. If the coefficient is not statistically significant, the finding has too much room for changes, and no correlation can be determined (Gustafsson, 2019.)

(1) First, we look at the question concerning the overall activity of nations and if it has helped their position from a GDP point of view. The formula for this model is:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4$$

In the formula:

x_1: Overall macroprudential activity of the country

x_2: Region dummy

x_3: Gross domestic product per capita

x_4: Logarithm of the population of studied countries

Before conducting the actual test, it is essential to study the correlation between the independent variables. The reason is the same as why the individual regression model

was built for both research questions. The correlation between individual variables can have adverse effects on the results. As table three illustrates, there is some correlation between the variables. Especially, the two logarithmic variables are correlated with statistical significance. However, it is not significant enough that any of the individual variables would be removed.

Table 3 Correlation of the variables of the first research question

Correlations

		GDP	Macroprudential activity of a country	Regional dummy	Logarithmic GDP per capita 2020	Logarithmic population of countries
Pearson Correlation	GDP	1,000	,007	-,040	,231	-,110
			(0,482)	(0,396)	(0,059)	(0,230)
	Macroprudential activity of a country	,007	1,000	,106	,059	,112
		(0,482)		(0,238)	(0,348)	(0,226)
	Regional dummy	-,040	,106	1,000	,422	-,506
		(0,396)	(0,238)		(0,002)	(0,000)
	Logarithmic GDP per capita 2020	,231	,059	,422	1,000	-,541
		(0,059)	(0,348)	(0,002)		(0,000)
	Logarithmic population of countries	-,110	,112	-,506	-,541	1,000
		(0,230)	(0,226)	(0,000)	(0,000)	

a. The number of studied countries N = 47

The results of the multiple regression model are presented in table 4. The first conclusion drawn is that the coefficient beta is so minuscule for overall macroprudential activity that it does not affect the dependent variable. On the other hand, the betas of the regional dummy and the logarithmic GDP per capita are notable. The results state that European countries have suffered significantly more than nations elsewhere and richer countries has suffered less economically than poorer countries during the pandemic. However, it is not statistically significant at the level of 5%. Thus, this data and method provides no statistically significant evidence to support correlation between the macroprudential activity and lessen economic suffer during the pandemic. Next, the same test is performed to study the other question.

Table 4 Regression coefficient of the first research question

Model		Unstandardized Coefficients		Standardized Coefficients	
		B	Std. Error	Beta	t
1	(Constant)	-11,895 (0,255)	10,314		-1,153
	Macroprudential activity of a country	,034 (0,913)	,312	,017	,110
	Regional dummy	-1,250 (0,298)	1,186	-,187	-1,053
	Logarithmic GDP per capita 2020	2,290 (0,131)	1,487	,279	1,540
	Logarithmic population of countries	-,228 (0,773)	,787	-,056	-,290

a. Dependent Variable: y = annual change of GDP in 2020

b. Statistical significance in ( ) below the coefficient

(2) In the second research question, where the activity is divided into instrument categories, the formula for the test is:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6$$

In the formula:

x_1: Use of credit-related instruments

x_2: Use of liquidity-related instruments

x_3: Use of capital-related instruments

x_4: Region dummy

x_5: Gross domestic product per capita

x_6: Logarithm of the population of studied countries

Again, the first step is to check if there is a correlation between dependent and one or more independent variables. Figure five illustrates the results. Most of the variables that

correlate with each other are similar than in Table 3. However, there is one new which is between the capital-related activity and regional dummy. This correlation is caused by the fact that many of the European countries suspended their banking sector from paying dividends. It was done to enhance the capital reserves of the institutions. However, as it many other capital-related instruments were applied in and outside of Europe the correlation slight enough that the variable remains in the regression model.

Table 5 Correlation of the variables of the second research question

Correlations

		GDP	Credit-related activity	Liquidity-related activity	Capital-related activity	Regional dummy	Logarithmic GDP per capita 2020	Logarithmic population of countries
Pearson Correlation	GDP	1,000	,009 (0,475)	,122 (0,207)	-,108 (0,234)	-,040 (0,396)	,231 (0,059)	-,110 (0,230)
	Credit-related activity	,009 (0,475)	1,000	,014 (0,463)	,165 (0,134)	-,069 (0,323)	-,035 (0,408)	-,119 (0,213)
	Liquidity-related activity	,122 (0,207)	,014 (0,463)	1,000	-,070 (0,319)	-,291 (0,024)	-,139 (0,176)	,448 (0,001)
	Capital-related activity	-,108 (0,234)	,165 (0,134)	-,070 (0,319)	1,000	,496 (0,000)	,251 (0,044)	-,131 (0,189)
	Regional dummy	-,040 (0,396)	-,069 (0,323)	-,291 (0,024)	,496 (0,000)	1,000	,422 (0,002)	-,506 (0,000)
	Logarithmic GDP per capita 2020	,231 (0,059)	-,035 (0,408)	-,139 (0,176)	,251 (0,044)	,422 (0,002)	1,000	-,541 (0,000)
	Logarithmic population of countries	-,110 (0,230)	-,119 (0,213)	,448 (0,001)	-,131 (0,189)	-,506 (0,000)	-,541 (0,000)	1,000

a. The number of studied countries N = 47

Table six illustrates the multiple linear regression model of the second research question. In the table, the liquidity-related and capital-related instruments have a coefficient that is notable. However, with capital-related, the dependency would be opposite to what the hypothesis is looking to find. With a negative correlation, the GDP would decrease if

a country applies more capital-related instruments. The regional dummy, logarithmic GDP per capita and logarithmic population remained close to the level of the first regression model. Out of them the regional dummy changed the most now the coefficient being -0,558. Again, none of the variables are statistically significant at the 5% level, and thus the second hypothesis is also rejected. There is one conclusion that can be drawn by this regression. No statistically significant correlation can be determined between specific activity category and how well a country economically coped with pandemic.

Table 6 Regression coefficient of the second research question

Model		Unstandardized Coefficients		Standardized Coefficients	
		B	Std. Error	Beta	t
1	(Constant)	-10,614	11,160		-,951
		(0,347)			
	Credit-related activity	,092	,655	,022	,141
		(0,889)			
	Liquidity-related activity	,612	,617	,168	,992
		(0,327)			
	Capital-related activity	-,466	,608	-,140	-,766
		(0,448)			
	Regional dummy	-,558	1,389	-,084	-,402
		(0,690)			
	Logarithmic GDP per capita 2020	2,251	1,533	,274	1,468
		(0,150)			
	Logarithmic population of countries	-,388	,885	-,096	-,438
		(0,664)			

a. Dependent Variable: y = annual change of GDP in 2020

b. Statistical significance in ( ) below the coefficient

As neither of the multiple linear regression models provided statistically significant results, it is essential to reflect on what could be done differently next time. First, more countries could have been examined to have more observations. Having a larger sample might lead to finding patterns that went undetected with this database. However, it would also be significantly more time-consuming. Secondly, by knowing the exact

moment when each instrument is applied, the study could have been conducted as longitudinal. Thus, it would have been possible to see if there have been significant differences at the monthly or quarterly level.

Also, having more explicit definitions of macroprudential instruments would help as having more instruments categorized can impact the result. The problem can be solved by building an international database of used macroprudential instruments. It could hold basic information of measurements applied as currently the information is mainly found from press releases of individual central banks. As for some less developed countries, the releases are not translated, so going through them requires notable effort. Having a such database could also boost the research of macroprudential instruments. The last data-related idea is not to divide the instruments into categories but only to measure the activity. As previously mentioned, the IMF data included significant numbers of observations that could not be categorized. The overall activity could provide different answers.

Also, there are more than just data-related issues that could have been done differently in the thesis. For example, the approach of the research questions could have been different. A risk was taken by studying the research questions from the activity point of view. No study has used this view before to research the macroprudential instruments. It means that no prior studies can be used to reflect the utilized research method. Thinking now, the subject could have been approached from the view of advanced economies and emerging economies. As there are preceding studies on the subject, this thesis could have studied if previously found patterns had changed during the pandemic. Now it is time to discuss the other macroprudential findings that were not discussed in the empirical part.

5.3 Other findings and discussion

This chapter aims not to discuss all the other findings from the IMF (2021) summary but to look at the most common ones and explain their importance on the macroprudential level. The most used non categorized instrument was granting borrowers moratoriums or extending the loan payments without penalties. Thus, the consumers did not need to adjust their spending so notably, and so the crisis did not spread into the real economy the same way. Also, as the banks did not need to take actions on the bad loans, they could concentrate on maintaining the liquidity of the economy.

The second most used was reconstructing loans without downgrading them or changing their classification, which was applied in 23 countries. The measurement relieves the stress of both consumer and creditor. However, this also meant that individuals or companies that would have otherwise deserved a downgrade did not receive one. This method may affect the risk of banks' loan portfolios in the future if insolvent companies have received more loans due to the easing.

Many countries also aided specific sectors that suffered the most during the pandemic. Especially in countries with significant traveling industry, the state compensated for the losses. However, some countries also helped the service industries but also agriculture. This help can be seen as part of fiscal policy, but it also helps to stabilize the real economy. It eases the financial cycle, and the banks do not need to deal with increasing bankruptcies due to the pandemic.

The last observation was that Australia and Chile postponed the appliance of the new Basel regulation. Most likely, they considered that reforming the regulation is better to be done under more stable times. Australia also halted the granting of new banking licenses for six months from April 2020, according to Waterford (2020). According to her, the decision is made to enhance the economic stability as the situation is very peculiar and requires better supervision. The Australian Prudential Regulation Authority that

Waterford represents points out that it would be highly troublesome to thrive as a new operator in these circumstances.

As seen, all the measurements discussed in this chapter loosen the current banking regulation in the countries. In the short term, this provides more resilience as consumers do not need to shift their consuming behaviour drastically. Also, the banks can fully concentrate on enhancing the economy. These instruments seem to be working. For 43 out of 47 studied countries, the GDP has risen compared to the previous period during the second quarter of 2021. Also, the economic growth is expected to proceed as the Bank of Finland (2021b) forecasts that the economy will grow steadily from 2021 to 2023.

However, in the long run, the pandemic is far from being over. According to Johns Hopkins University (2021), more than half a million daily cases are still recorded globally. The vaccines can deal with current variants, but as the Bank of Finland (2021b) states in Euro & Talous, possibility of new resistant mutation is present. Thus, the virus can still affect the global economy with new shocks in the future. Also, the Bank of Finland discusses the possible rise of inflation as the economy recovers, and there are still issues with some production chains due to the pandemic. Especially, the prices of semiconductors have risen significantly. The rising inflation could lead to a situation where central banks would be forced to increase their interest rates.

Furthermore, like many nations, consumers and companies have accumulated more debt during the crisis, the rise of interest rates could significantly impact their economy. Therefore, it could lead to new economic turmoil if done without great care. Also, the macroprudential alleviations such as reclassification without penalties or not dealing with bad loans can resurge troubles on the loan portfolios. These issues can lead to significant instability in the banking sector, leading to troubles in the real economy. Nonetheless, even if it is important to be conscious of possible scenarios, it is better to hope none of them will materialize. Hence the world would keep on opening, step by step, and we could return to living as before the pandemic.

6 Conclusion

The COVID-19 has affected our lives for more than one and a half years already. Even if more people are vaccinated daily worldwide, it is still unknown when the disease ultimately stops affecting our lives. The pandemic has also taken a great toll on the economy. This thesis aims to measure if macroprudential instruments have eased the financial distress during the pandemic. Many countries experienced significant financial setbacks as the adverse shocks and quarantines started taking place globally.

The idea of macroprudential supervision is to maintain the stability of the whole banking system, not just the soundness of individual banks, as Borio (2003) puts it. This goal means reducing the systemic risk divided into cyclical and structural, that accumulates in the markets. Thus, the instruments build resilience against negative shocks that occur in the financial system. Some of the measurements we use today were already in use after the Second World War, according to Draghi (2019). However, they were nearly wholly forgotten, but Akinci and Olmstead-Rumsey (2017) discuss that they re-emerged in the aftermath of the Great Recession. They emphasize that the turmoil made supervisors and regulators understand how interconnected the global economy is nowadays.

European Systemic Risk Board (2018) points that even minor changes in domestic banking regulation can change consumers' borrowing behaviour. For example, restrictions can shift the lending towards that the loans are applied in a foreign currency, from a foreign bank, or a branch office of a foreign institution. Also, as the number of non-banking financial institutions increases, institutions without sufficient supervision increase. Considering these facts, it is easy to see why supervising the whole financial market as one entity was adopted again.

There are many ways to detect changes in systemic risk. For example, countries sometimes follow basic quantitative measures such as debt-to-GDP, but more early signals are developed continually. This development is because the new statistical indicators can predict upcoming instability well before it materializes. Furthermore, to fight the risk

distinguished by these signals, there are macroprudential instruments. They can be divided into three categories, as (Lim et al., 2011) do in IMF working paper. The categories are:

1. Credit-related instruments that aim to reduce the demand for loans.
2. Liquidity-related instruments tackle the supply of lending by determining stable funding of an institution
3. Capital-related instruments are often buffers or other measures that accumulate more capital on the banks' reserves that can be released during a downturn.

Even if the re-emerge of macroprudential instruments did occur not too long ago, there is evidence that they have worked well on stabilizing the economy. The report of IMF (2017) and study of Akinci and Olmstead-Rumsey (2017) conclude that macroprudential instruments have been able to control the growth of credit, thus dampening the heating economy. However, Cerutti et al. (2015) conclude that the instruments are not as efficient in the bust phase, such as one now caused by the pandemic. The objective is to provide more information on how well the macroprudential instruments can help the economy in trouble.

As it is complicated to measure the exact effect of measurements, this thesis aims to see if countries would suffer more minuscule welfare losses by being more active or applying instruments from specific categories. The two research questions were studied using the multiple linear regression model in SPSS. However, no statistically significant results could be drawn from the data. It means that with this data, the macroprudential activity has no proven effect on how well a country has economically coped during the Covid-pandemic.

However, even if the only finding of the empirical part was that there is no correlation between the activity and reduced welfare loss, studying the topic raised multiple thoughts that could be researched in the future. First, the economic effects of COVID-19

should be studied as a longitudinal study as some of the effects may take a longer time. Thus, they would be hard to detect in a cross-sectional study done during the event. Also, a globally accepted framework should be formed for macroprudential instruments. With a distinct framework, it would be easier to determine macroprudential measurements from other economic instruments. Additionally, a global dataset can be built after explicit rules, which would ease studying the subject. In the long run, this could lead to more research that could establish the macroprudential instruments as a more credible choice when dealing with economic troubles.

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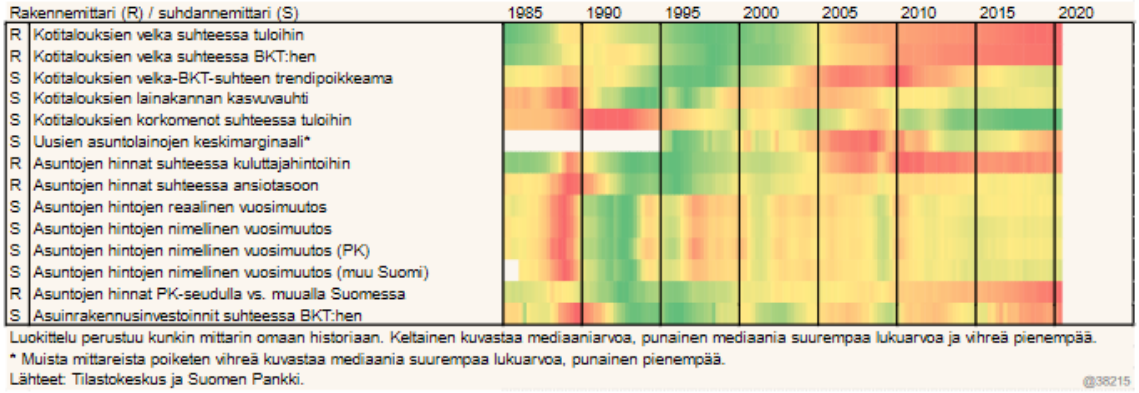
Appendices

Appendix 1 The indicators followed by the Bank of Finland (2020.)



Appendix 2 The identified risks in the European economy by (Constâncio et al. 2019.)

Table 2

Identified vulnerabilities based on selected univariate signalling models with asset price indicators

	Residential property price overvaluation measure	Residential property price-to-income ratio	Real residential property price average 3-year growth rate	Real equity price average 3-year growth rate
Latest observations	Q3 2017 [1]	Q3 2017 [1]	Q3 2017 [2]	Q4 2017
Country 1	-8.0	-6.0	10.8	11.4
Country 2	6.0	15.0	1.0	3.1
Country 3	4.0	5.0	5.1	7.5
Country 4	4.5	7.0	0.5	6.7
Country 5	-6.5	-8.0	-0.5	-8.4
Country 6	-5.5	-3.0	-1.8	7.0
Country 7	1.0	5.0	5.1	0.7
Country 8	-13.0	-17.0	-2.7	-15.6
Country 9	-4.5	2.0	6.4	18.3
Country 10	22.0	27.0	3.9	16.6
Country 11	13.0	16.0	0.3	10.1
AUROC	0.83	0.72	0.69	0.66
High threshold: theta = 0.3	17.44 (CP: 0.45 / T1: 0.54 / T2: 0.07)	9.92 (CP: 0.29 / T1: 0.49 / T2: 0.16)	9.34 (CP: 0.31 / T1: 0.56 / T2: 0.12)	300.65 (CP: . / T1: 1.00 / T2: 0.00)
Med-high threshold: theta = 0.4	13.96 (CP: 0.40 / T1: 0.49 / T2: 0.10)	9.92 (CP: 0.29 / T1: 0.49 / T2: 0.16)	9.27 (CP: 0.31 / T1: 0.56 / T2: 0.13)	11.87 (CP: 0.16 / T1: 0.31 / T2: 0.35)
Medium threshold: theta = 0.5	2.46 (CP: 0.26 / T1: 0.23 / T2: 0.28)	3.77 (CP: 0.25 / T1: 0.40 / T2: 0.22)	7.11 (CP: 0.25 / T1: 0.45 / T2: 0.21)	8.28 (CP: 0.15 / T1: 0.26 / T2: 0.40)
Med-low threshold: theta = 0.6	-6.67 (CP: 0.19 / T1: 0.01 / T2: 0.54)	-16.38 (CP: 0.16 / T1: 0.14 / T2: 0.57)	-2.72 (CP: 0.13 / T1: 0.01 / T2: 0.85)	5.04 (CP: 0.14 / T1: 0.21 / T2: 0.45)
Low threshold: theta = 0.7	-6.67 (CP: 0.19 / T1: 0.01 / T2: 0.54)	-22.37 (CP: 0.14 / T1: 0.08 / T2: 0.70)	-2.72 (CP: 0.13 / T1: 0.01 / T2: 0.85)	-2.84 (CP: 0.12 / T1: 0.11 / T2: 0.64)

Conditional crisis probability > 40%	Conditional crisis probability > 25%
Conditional crisis probability > 35%	Conditional crisis probability > 20%
Conditional crisis probability > 30%	Conditional crisis probability > 15%

Source: ECB calculations.
Notes: The colour coding is based on the conditional probability that a banking crisis could materialise within the next 12 to 5 quarters upon a crisis signal being issued. This conditional probability depends on the specific signalling threshold that is being breached. In general, a higher preference for not missing vulnerable states leads to a lower signalling threshold and more false alarms being issued, which is usually associated with a lower conditional distress probability. For each indicator or model, five different signalling thresholds are applied based on preference parameters ranging between 0.7 (strong preference for not missing vulnerable states) and 0.3 (strong preference for not issuing false alarms). T1 refers to the type 1 error rate, T2 to the type 2 error rate and CP to the conditional probability associated with each threshold. Footnotes 1) and 2) Countries 1 and 5 as of Q2 2017.

Appendix 3 The macroprudential activities performed by studied countries (IMF 2021a; ECB 2020a & ESRB 2021a.)

Country	Credit-related	Liquidity-related	Capital-related
Argentina			
Australia		Released buffers & suspended dividends	
Austria			Suspended dividends
Belgium			Released countercyclical buffer and suspended dividends
Brazil			Release of capital conservation buffer & eased provision
Bulgaria			Suspended dividends
Canada			Lower domestic stability buffer of risk weighted assets for OSFI institutions
Chile		Eased liquidity coverage ratio	
China		Changes in NPL provision coverage requirements &	

		cross-border financing level	
Colombia			
Costa Rica	Stress test for boorowers		countercyclical provision to 0
Czech Republic	Changes in LTV and DSTI ration. Then removing DTI and DSTI ratios.		Twice reductio of countercyclical buffer and suspended dividends
Denmark		Eased liquidity coverage ratio	Release of countercyclical buffer and suspended dividends and buybacks
Estonia			Released systemic risk buffer and suspended dividends
Finland	Change in loan-to-collateral ratio		Releasing systemic risk buffer, institution specific requirements, changes in risk weights and suspended dividends
France			Release of countercyclical buffer and suspended dividends and buybacks

Germany			Release of counter-cyclical buffer and suspended dividends and buy-backs
Greece		Changes in liquidity coverage ratio	Release of capital conservation buffer and suspended dividends
Hungary		Changes in foreign exchange coverage ratio and more relaxed foreign lending	Eased capital buffer of systemically-important banks and suspended dividends
Iceland	Increased LTV ratio and net stable funding ratio		Released counter-cyclical capital buffer
India	Delay of net stable funding ratio	Reduced liquidity coverage ratio, eased risk weighted assets regulation and changes in counterparty exposure	Capital conservation buffer delay and suspended dividends
Indonesia	Change in LTV and net stable funding ratio	Changes in liquidity coverage ratio	Released counter-cyclical capital buffer
Ireland			Release of counter-cyclical buffer and

			suspended dividends
Israel	Changes in LTV and debt-to-income ratio	Reducing leverage ratio	Eased capital requirements
Italy		Function momentarily under liquidity requirements	Function below capital requirements and suspended dividends
Latvia			Suspended dividends
Lithuania			Release of countercyclical buffer and suspended dividends
Luxembourg			Suspended dividends
Mexico			Suspended dividends and buybacks and partly released capital buffers
Netherland		Momentarily functioning below the liquidity coverage ratio	Release of capital conservation buffer, suspended dividends, systemic buffer requirements for three biggest banks and different

			requirements on calculation exposures.
New Zealand	Changes in LTV ratio	Changes in core funding ratio and delay of regulatory change of higher liquidity requirements	Suspended dividends
Norway	Eased mortgage regulation	Function below the liquidity coverage ratio	Release of countercyclical buffer and suspended dividends
Poland		Reduced risk-weights	Released systemic risk buffer and suspended dividends
Portugal	Changes in debt-to-stable-income ratio	Allowed to function below liquidity requirements	Postponing capital buffers for OSIIs, suspending dividends and working below capital requirements
Romania			Suspended dividends
Russia		Eased risk-weight regulation, eased liquidity regulation for SIIs	Reducing/cancelling risk buffers of certain loans
Saudi Arabia			

Slovakia		Changes in liquidity coverage ratio	Function below capital conservation budder, release of countercyclical buffer and suspended dividends
Slovenia			Suspended dividends
South Africa		Liquidity coverage reductions	relief on capital requirements and suspended dividends
South Korea		Eased loan-to-deposit and liquidity coverage ratio & reduced minimum foreign exchange liquidity coverage ratio	
Spain			Suspended dividends
Sweden			Release of countercyclical buffer and suspended dividends
Switzerland		Central bank deposits off from leverage ratio	Release of countercyclical buffer and suspended dividends

Turkey			Suspended dividends
United Kingdom		Changes in risk-weighted assets as VaR compensates	Maintaining systemic risk buffer, release countercyclical buffer and suspended dividends
United States		Release of liquidity buffers, changes in calculating the leverage ratio and reduction of community banks' leverage ratio	Release of capital buffers

Appendix 4 The classification of economies IMF (2021b.)

Advanced economies	Emerging and developing economies
Australia	Argentina
Austria	Brazil
Belgium	Bulgaria
Canada	Chile
Czech Republic	China
Denmark	Colombia
Estonia	Costa Rica
Finland	Hungary
France	India
Germany	Indonesia
Greece	Mexico
Iceland	Poland
Ireland	Romania
Israel	Russia
Italy	Saudi Arabia
Latvia	South Africa
Lithuania	Turkey
Luxembourg	
Netherlands	
New Zealand	
Norway	
Portugal	
Slovakia	
Slovenia	
South Korea	
Spain	

Sweden	
Switzerland	
United Kingdom	
United States	